**VSB — TECHNICAL UNIVERSITY OF OSTRAVA FACULTY OF ECONOMICS**

DEPARTMENT OF FINANCE

# Ocenění společnosti China Resource Beer Company Limited za podmínek rizika

# Valuation of the China Resource Beer Company Limited under the Risk Terms

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3. Basic Characteristics of the China Resource Beer Company Limited
4. Estimation of the Expected Market Value of the China Resource Beer Company Limited
5. Conclusion

Bibliography
List of Abbreviations
Declaration of Utilisation of Results from the Diploma Thesis
List of Annexes
Annexes

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Content

# 1. Introduction

The aim of this thesis is to estimate the probability distribution of market value of China Resource Beer Company Limited at the end of 2017 by two-stage Discount Cash Flow method.

The thesis is divided into five chapters, the first chapter is introduction, we will introduce the aim and main structures of this thesis.

The second chapter is theoretical part. In this chapter, we will introduce all the models and functions that will be used for practical part, at first, we will give a general description of company's valuation, then financial ratio analysis and common size analysis will be introduced. For the estimation of sales revenues, we will introduce the sale prediction model and Monte Carlo Simulation, next we will give an introduction of DCF method, we assume company can do business from now to infinity, we need to predict all parameters which will be used by two-stage DCF method, therefore, we need to do financial plan, we will determine the forecast driver for financial plan, then give the standard of how to calculate weighted average cost of capital, finally, we will introduce the basic of sensitivity analysis of company.

The third chapter is about analyzing the performance of China Resource Beer Company Limited. We will give an introduction about our company, then introduce the main competitors, use strategy analysis from external and internal side of company, next we will do financial analysis, which include common size analysis and financial ratio analysis, for the common size analysis, we will analysis key items in financial statement, for the financial ratio analysis, we will analysis company's profitability, liquidity, activity, solvency from historical data.

The fourth chapter is the most important part of thesis, we will apply the model and method we already introduced in Chapter 2, at first, we will regress out our sale revenues function by using regression model, then use Monte Carlo Simulation create 10,000 random scenarios to support predict the independent variables, next step is applying

financial plan, calculate cost of capital, return on invested capital, and growth rate, after computing all the parameters, we can get 10000 scenarios of expected market value, then we need to analysis the sensitivity of growth rate and return on invested capital, because our expected market value is lower than the book value at the end of 2017, therefore we also need to calculate its liquidation value, and compare expected value and liquidation value.

The fifth chapter is the conclusion of thesis, we will summarize the analysis result in Chapter 4, give some suggestion and comments.

# 2. Description of the Valuation Process Methodology

This Chapter is the theoretical part, we will introduce the method we will use in Chapter 3 and Chapter 4, which including the financial analysis methods, sale regression model, and financial pan for FCFF. And the method of estimating WACC.

## 2.1 General Description of Company Valuation

Valuation is a process of estimating property, including both assets and liabilities. There are five assumptions of valuation, they are: which value we want to determine; for who we want to determine the value; the purpose of a valuation; valuation date; which method should be used.

As for the purpose of a valuation, it includes determining whether buying or selling operations; it is beneficial to IPO; making strategic decisions on the company's continued development; making strategic plans, estates, income taxes, and so on; it is beneficial to mergers and acquisitions activity. Therefore, valuation is very important for company.

There are the most important types of values:

1. Market value
2. Investment value
3. Intrinsic value.

**Market value**: it's also called as fair value. *Hitchner (2011, p.3)* defined that it is "the price at which the property would change hands between a willing buyer and a willing seller, neither being under compulsion to buy or to sell and both having reasonable knowledge of relevant facts." In other words, it means that market value is not depended on the individual opinion of transaction participants.

**Investment value**: it is also called as subjective value, can be defined, *Hichner (2011, p.5)* as "the value to a particular investor based on individual investment requirements and expectations." The investment value to one particular owner or

prospective owner could be different from the market value. Compared investment value with market value, the perceptions of estimating the future earning power is different. On the other hand, perceptions of the degree of risk involved is different too.

**Intrinsic value**: it is also called fundamental value, is the real value of an item, which is based on evaluation of available facts and fundamental analysis of the publicly traded company without reference to its market value. The value investors usually use a variety of analytical techniques to estimate the intrinsic value in order to find out the true value of the investment which exceeds the current market value. Then, it is possible for the investors to make better investment decisions, like whether it is appropriate to buy, sell, or hold the stocks.

After distinguished the difference among three value, we will start to introduce main approaches for valuation. They are

1. Income approach
2. Assets-based approach
3. Market approach

**Income approach** are based on the estimation of the value of an ownership interest as a sum of the present values of the expected future benefits of owning that interest. [1] It can be defined by *Hitchner (2011, p.122)* as "the income approach is a mathematical fraction consisting of a numerator and a dominator, the numerator represents the future payments of an investment, and the dominator represents the quantification of the associated risk and uncertainty of those future payments." Income approach consists of three method:

1. Discounted cash flow (DCF)method
2. Economic value added (EVA) method
3. Capitalized income method

[1] https://lms.vsb.cz/pluginfile.php/760063/mod_resource/content/0/Basics%20of%20Company%20Valuation.pdf

Discounted cash flows currently dominate both theoretical and practical approaches, because they are more focused on the market procedures and market values. Method of economic value added used to measure the real profitability. Method of capitalized income is based on the principle of present value of the future earnings. Earnings are estimated from the historical data.

**Asset-based methods** seek to determine the company's value by estimating the fair market value of its every single asset. It determines a company's value, *Hitchner (2011, P309)*, by "presenting the value of all the tangible and intangible assets and liabilities of the company".

**Market approach** is a comparable approach, it means the value of the business can be determined by reference to reasonably comparable companies, for which values are known.[2]

### 2.2 financial analysis

Financial analysis is a process of selecting, evaluating and interpreting financial data of businesses in order to determine whether they are suitable or not to be invested in. It aims to formulate the assessment of the company's present and future financial position. In this part, we will introduce common size analysis and financial ratio analysis.

#### 2.2.1 Common size analysis

Common-size analysis *Hitchner (2003, p.86)* are "once financial data has been normalized, analysts commonly employ an analytical methodology to identify operational trends— "common sizing" the financial statements."

**Horizontal financial statement analysis**

[2] https://lms.vsb.cz/pluginfile.php/760063/mod_resource/content/0/Basics%20of%20Company%20Valuation.pdf

It is also referred as trend analysis, is the comparison of company's financial report information over some periods of time. Applying horizontal analysis to firm's statements makes it comfortable to estimate its performance over time.

**Vertical financial statement analysis**

It is the analysis of items of the company's statements when one item is being compared to the base item. While the horizontal analysis aims to estimate the dynamics, vertical is commonly applied for a single period. The reason for performing it is the necessity to estimate the relative proportions of different assets and finance sources elements.

### 2.2.2 Financial ratio analysis

Financial ratio analysis is analyzing the ratio of two items on the financial statemen, these ratios can reflect the enterprise management and operation. It is divided into four types, profitability ratio, liquidity ratio, solvency ratio and activity ratio.

**Profitability ratio**

Profitability ratio is one of the most frequently used tools of financial ratio analysis, which measure the ability to generate profit from invested capital in the form of return during a period. Profitability ratios show the overall efficiency and performance of a company.

ROA is called as return on assets, it's the most important indicator of a company's profitability and growth potential. It measures every unit of assets can get how much net income. The higher the ROA, the more the profitable, the company.

$$Return\ on\ assets = \frac{EAT}{Total\ assets} \tag{2.1}$$

ROE is called return on equity, it's also the most important indicator of a company's profitability and growth potential. It can evaluate the ability of a company to generate its net income by the equity.

$$Return\ on\ equity = \frac{EAT}{Equity} \quad (2.2)$$

Operating profit margin can reflect the proportion of operating income in total revenue, it measures the company's ability to general profit to deal with its cost of operations.

$$Operating\ profit\ margin = \frac{Operating\ income}{Total\ revenue} \quad (2.3)$$

Net profit margin can reflect the proportion of net income in total revenue. the role of net profit margin is similar with operating profit.

$$Net\ profit\ margin = \frac{EAT}{Total\ revenue} \quad (2.4)$$

ROIC is the return on invested capital, it represents the investment efficiency of the company, higher ROIC means higher terminal value of company.

$$Return\ on\ invested\ capital = \frac{EBIT(1-t)}{Invested\ capital} \quad (2.5)$$

**Liquidity ratio**

Liquidity ratio measures the company's ability to meet its immediate or short-term liabilities and obligations. These ratios analyze the company's liquid assets and short-term liabilities and obligation. Liquidity ratios include current ratio, quick ratio, and cash ratio.

Current ratio is the ratio between current assets and current labilities, it can measure whether the company's current assets can cover the short-term liabilities.

$$Current\ ratio = \frac{Current\ assets}{Current\ liabilities} \quad (2.6)$$

Quick ratio is the ratio between liquidity asset excluding inventory and current liabilities, it indicates how much the liquidity assets can cover one unit of current liabilities:

$$Quick\ ratio = \frac{Cash+short-term\ marketable\ investment+recevablies}{Current\ liabilities} \quad (2.7)$$

Cash ratio is the ratio between cash plus short-term marketable investment and current liabilities, it can reflect how much the most liquidity assets can cover one unit of current liabilities.

$$Cash\ ratio = \frac{Cash+short-term\ marketable\ investment}{Current\ liabilities} \quad (2.8)$$

**Solvency ratio**

Solvency ratio measures the company's ability to meet its long-term obligations. They indicate whether a company's cash flow is enough to meet its liabilities.

Debt to assets ratio is the ratio between total liabilities and total debt. It indicates how many total assets are financed with debts, if the ratio If the ratio is close to 1, means most of the assets are funded by liabilities rather equities, so the company may have the risk of default in the future.

$$Debt\ to\ assets\ ratio = \frac{Total\ debt}{Total\ assets} \quad (2.9)$$

Debt to equity ratio is the ratio between total debt and total equity, the smaller ratio means the company has smaller pressure for its long – term liabilities.

$$Debt\ to\ equity\ ratio = \frac{Total\ equity}{Total\ assets} \quad (2.10)$$

Interest coverage ratio is the ratio between gross income and interest charge, this ratio can show the ability of company to pay its interest, the higher the ratio, the better.

$$Interest\ coverage\ = \frac{EBIT}{Interest\ paid} \quad (2.11)$$

**Activity ratio**

Activity ratios generally measure how well a company uses its assets. It has a direct impact on liquidity to utilize assets efficiently. These ratios are important in determining whether a company's management is doing a good job or not of generating revenues or cash from its resources.

Inventory turnover is the ratio between cost of goods and average inventory, it can reflect the times of selling inventory in one year, the smaller ratio means the risk of inventory overstock and loss is higher.

$$Inventroy\ turnover\ = \frac{Cost\ of\ goods\ sold}{Average\ inventory} \tag{2.12}$$

Receivable turnover is the ratio between sales and average receivables, it can reflect the average time for a company to collect account receivables, the higher ratio means stronger ability of collecting receivables.

$$Receivable\ turnover = \frac{Revenues}{Average\ recievables} \tag{2.13}$$

Assets turnover can reflect the ability for a company to effective use assets to realize market sell. The higher assets turnover reflects the stronger sales ability of a company.

$$Assets\ turnover = \frac{Revenues}{Average\ total\ assets} \tag{2.14}$$

## 2.3 Sales Revenues Prediction

This part will explain the model and processes we will use in Chapter 4, because we use two stage DCF method to estimate the valuation of company, it is important to predict sales revenues in future, therefore we will regress out sales revenues function at first, then use Monte Carlo Simulation and create 10000 scenarios of random variables to analysis the correlation between independent variables.

### 2.3.1 Sales Revenue Prediction

In this part, Ordinary least square (OLS) method will be used to regress out the sales function, we can firstly collect the historical sales of company from income statement, regard it as dependent variable, then we need to find the independent variables that can influence dependent variable, it can be macroeconomic index, such as GDP, CPI, population, interest rate or cost of materials of products.

*Monahan (2001, p.428)* states that "the linear stochastic regression model can be expressed as:"

$$\mathrm{y} = \beta_0 + \beta_i \cdot x_i + \varepsilon_i \tag{2.15}$$

where in formula (2.15), y is dependent variables, $x_i$ is independent variables, $\beta_0$ is intercept parameter, $\beta_i$ is the slope parameter between $x_i$ and y, different independent variable has different β, the positive β reflect the positive relationship between $x_i$ and y, negative β reflect the negative relationship between $x_i$ and y, $\varepsilon_i$ is random error term or residuals.

In order to satisfy the minimization of error, there are some constraints:

$$\sum_{i=1}^{n}\left(y_i - \hat{\beta}_0 - \hat{\beta}_i \cdot x_i\right) = 0 \tag{2.16}$$

$$\hat{\beta}_i = \frac{\sum_{\mathrm{i}=1}^{\mathrm{n}}(\mathrm{x_i}-\bar{\mathrm{x}})(\mathrm{y_i}-\bar{\mathrm{y}})}{\sum_{\mathrm{i}=1}^{\mathrm{n}}(\mathrm{x_i}-\bar{\mathrm{x}})^2} \tag{2.17}$$

$$\bar{y} = \hat{\beta}_0 + \hat{\beta}_i \cdot \bar{\mathrm{x}} \tag{2.18}$$

Where in formula (2.17), $\bar{\mathrm{x}}$ and $\bar{y}$ is the mathematic average of sample independent variables and independent variables.

Then we use STATA to make regression function analysis and get regression function, what should pay attention is that not all independent variables have significant influence on dependent variables, a significant regression model should observe the following conditions:

R-square: $R^2$ is called as coefficient of determination. *Jeffrey (2012, p.39)* states that " $R^2$ is the ratio of the explained variance compared to the total variation, and thus it is interpreted as the fraction of the sample variance in *y* that is explained by *x*." It can show how much our model explains the changes in the dependent variable by using independent variables. Usually lower than 1, therefore, the bigger R-square indicate a better situation of regression.

P-value: P-value helps us to determine the significance of the result. The value of p-value should between 0 and 1, Usually we give the significant level at 5%, if P-value is bigger than 5%, it means we should fail to reject the null hypothesis, the regression result is not statistical significant, if P-value is smaller than 5%, it means there is a strong evidence against the null hypothesis, we reject the null hypothesis. So, the regression result is statistically significant.

Through thesis conditions, we can check whether the independent variables are significant for the regression model, after we find out the suitable regression model, we can know the relationship between independent variables and dependent variable through $\beta_i$ , the next step is checking the correlation between logarithmic returns of independent variables, if there is a big correlation, we must use Cholesky decomposition to adjust the random number, if the correlation is small enough, there is no necessary to use Cholesky decomposition to fix the correlation between random variables.

### 2.3.2 Monte Carlo Simulation

*ZMEŠKAL (2004, p.107)* states that "Monte Carlo Simulation can serve as a tool for generation of random scenarios and probability distributions of either particular assets or portfolios of financial assets." At first, we use Monte Carlo Simulation to calculate the random evolution of independent variables, because we need enough scenarios to accurate estimate free cash flow, hence we create 10000 scenarios, each scenarios can regard as uncertainty event the independent variables will face, we create random numbers as follow: Data → Data Analysis → Random Number Generation. And chose the mean equal to 0, standard deviation equal to 1, which means the random variables obey normal distribution.

Then we should calculate the expected logarithmic return as follows:

$$R(i) = ln\frac{s_t}{s_{t-1}} \tag{2.19}$$

Where in formula (2.19), *R(i)* is the expected logarithmic return for *i* and $s_t$ is the value of *i* at time *t*.

Next step is to check the correlation between logarithmic returns of independent variables, in the case of high correlation of logarithmic returns of independent variables, we will use Cholesky decomposition. The formula is as follows:

$$\vec{z}^T = \vec{e}^T \cdot p \tag{2.20}$$

Where in formula (2.20), $\vec{z}^T$ is the vector of independent random variables, $\vec{e}^T$ is a vector of independent random variables from normal distribution N (0;1) and $p$ is the upper triangular matrix.

Then we will calculate the upper triangular matrix p, the formula is as follows:

$$p_{ii} = (\sigma_{ii} - \sum_{k=1}^{i-1} P^2\, ki)^{1/2}, for\ i = 1,2,3 \ldots . N \tag{2.21}$$

$$p_{ij} = \left(\sigma_{ij} - \sum_{k=1}^{i-1} p_{ki} \cdot p_{kj}\right) \cdot p_{ii}^{-1}, for\ 1 \le i \le j \le N \tag{2.22}$$

$$p_{ij} = 0,\ for\ i \ge j; i, j = 1,2, \ldots \ldots N \tag{2.23}$$

Where in formula (2.21), σ is the standard deviation, p is the upper triangular matrix.

After we fixed the correlation, we will do evaluation of independent variables in future, we need to calculate some indicators prepared for final prediction of independent variables. They are as follows:

$$\mu = ln\frac{s_t}{s_{t-1}} \tag{2.24}$$

$$\alpha = \mu - \frac{\alpha^2}{2} \tag{2.25}$$

Where in formula (2.24) and (2.25), $\mu$ is the continuous logarithmic return, $\alpha$ is the standard deviation of continuous return. The final step is calculating the random evolution of independent variables of independent variables, the formula is as follows:

$$S_t = S_{t-1} \cdot exp\left(\alpha \cdot \Delta t + \sigma \cdot \tilde{z} \cdot \sqrt{\Delta t}\right) \tag{2.26}$$

Where in formula (2.26), $\tilde{z}$ is a random value from the standard normal distribution, $\Delta t$ is the length of each interval, $S_t$ is the value of independent variable at time *t*, $\sigma$ is the standard deviation from the continuous logarithmic returns.

## 2.4 Discounted cash flow method

In this part, the basic principle of DCF method will be introduced, further, we will give introduction of two-stage DCF method and pay attention to each parameter we needed to contribute the DCF method.

### 2.4.1 Introduction of DCF method

DCF method defined as *Hichner (2011, p. 143)*, that "the value of any operating assets or investments is equal to the present value of its expected future economic benefit stream." The value of a company is generally calculated as follows:

$$V = \sum_{t=1}^{T} \frac{FCFF_t}{(1+R)^t} \tag{2.27}$$

Where in formula (2.27), *V* is company's value, *R* is cost of capital, *FCFF* are free cash flows of firm, *t* represents specific time during the valuation process. We can calculate *FCFF* by the following formula:

$$FCFF = EBIT(1-t) + DEP - \Delta NWC - INV \tag{2.28}$$

Where in formula(2.28), $EBIT$ is earnings before interest and tax, $t$ is tax rate, $DEP$ is depreciation of company, $\Delta NWC$ is the change of net working capital, $INV$ is the investment for long term.

### 2.4.2 Two-stage DCF method

This method divided the life of company into two stages, the first stage is usually for 4-7years, the situation of company is more predictable and it is easier to estimate and plan FCFF from company activities relatively precisely, the second stage should last to infinity, in this situation only the trend in free cash flows can be estimated, company's value for two-stage method is equal to the sum of values of first stage and second stage.

$$V = V_1 + V_2 \tag{2.29}$$

Where in formula (2.29), $V_1$ is the value of company value in the first stage and $V_2$ is value of the company in the second stage, we also call it terminal or continual value of company.

$$V_1 = \sum_{t=1}^{T} \frac{FCFF_t}{(1+R_1)^t} \tag{2.30}$$

Where in formula (2.30), *T* is length (number of years) of the first stage, $R_1$ is cost of capital in the first stage. We can calculate free cash flow in the flowing way:

In second stage, we will work with the trend of *FCFF*, here we work with terminal value, *TV*. Then terminal value must be discounted to the valuation date *T*, and under the assumption that the free cash flows growth annually by rate *g*, the terminal value is calculated as follows:

$$TV = \frac{FCFF_{T+1}}{R_2 - g} \tag{2.31}$$

We can also express terminal value by the way of value drivers, the formula is as follows:

$$TV = \frac{NOPAT_{T+1} \cdot (1 - \frac{g}{ROIC})}{R_2 - g} \tag{2.32}$$

Where in formula (2.32), $R_2$ is the cost of capital in second stage. $NOPAT_{T+1}$ is the net operating profit after taxation in the beginning of the second stage, $g$ is the growth

rate of *FCFF*, *ROIC* is the return on invested capital. Finally, the company value can be defined as follows:

$$V = \sum_{t=1}^{T} \frac{FCFF_t}{(1+R_1)^t} + \frac{NOPAT_{T+1} \cdot (1-\frac{g}{ROIC})}{R_2 - g} \cdot (1+R_1)^T \tag{2.33}$$

## 2.5 Financial plan

In this part, financial plan will be introduced, we need to estimate the items which is included in formula(2.33), first we will estimate free cash flow according to formula(2.28), therefore we will do plan of EBIT, tax rate, investment, depreciation and change of net working capital, in each financial plan, we will use economic driver to predict the items we need, the choice of economic driver depend on whether they have strong relationship.

Then we need to predict weighted average cost of capital for the first stage and second stage, Return on invested capital and growth rate of free cash flow for the second period.

### Plan of Earnings before interest and tax

Earnings before interest and tax has a strong relationship with company's sales revenue, therefore we can use the ratio between EBIT and sales revenue to estimate EIBT in predict years, this ratio is called operating margin, the formula is as follows:

$$Operating\ margin = \frac{EBIT}{Sales} \tag{2.34}$$

We can easily get historical EBIT and sales from income statement, then we can compute the operating margin according to formula (2.34). Since different years has different operating margin, and importance of each year is different, it is better to give different weight to different year, we will give higher weight to recent years, lower weight to years long time ago, the method to calculate weighted average operating margin are as follows:

$$k = \sum_{i=1}^{t} k_i \cdot w_i \tag{2.35}$$

$$\sum_{i=1}^{t} w_i = 1 \tag{2.36}$$

Where in formula (2.35) and (2.36), $k$ is the weighted average operating margin, $k_i$ is the operating margin at time $i$, $w_i$ is the weight we gave at time $i$, total weight we gave should be equal to 1. We will use weighted average operating margin as constant ratio in the predict years, because we already get 10000 scenarios of predicted sales according to Monte Carlo Simulation, we can get 10000 scenarios of predicted EBIT by multiply operating margin and sales.

**Plan of Net working capital**

Since net working capital is the different between current assets and current liabilities, it is better for us to predict current assets and current liabilities at first, we will also connect them with sales, the formula are as follows:

$$r_1 = \frac{Current\ assets}{Sales} \tag{2.37}$$

$$r_2 = \frac{Current\ liabilities}{Sales} \tag{2.38}$$

Where in formula (2.37) and (2.38), $r_1$ is the ratio between current assets and sales, $r_2$ is the ratio between current liability and sales, we can get historical current assets and current liability in balance sheet, after calculate $r_1$ and $r_2$, we also use weighted average method to get weighted average ratio, we use these two ratios as constant in predict years, since we already have 10000 scenarios of sales, we can easily get predicted current assets and current liabilities, next step is getting the net working capital by calculating the difference between them, and also we can get the change of net working capital.

**Plan of Investment**

Investment can be regard as the capital used to fund operations in the long run. Investment can be found on a company's cash flow statement, it is associated with company's development and expansion, usually investment should be higher than depreciation, if the depreciation was higher than investment, it means this company has

insufficient investment, the value of fixed assets will become lower with time going by, which means company will can't afford any operating activity and go bankrupt. Therefore, when we do financial plans, we need to make investment higher than depreciation. we can also associate investment with sales.

$$r = \frac{INV}{Sales} \tag{2.39}$$

Where in formula (2.39), $INV$ represents investment, we can easily calculate historical ratio between investment and sales, then we use weighted average method, get weighted investment to sales ratio, use it as a constant ratio in predict years, we can easily get investment by multiply sales and weighted average ratio, finally we can get 10000 scenarios of investment for predict years.

**Plan of Depreciation**

Depreciation is the cost of a tangible asset over its useful life and is used to account for declines in value, therefore depreciation has close relationship with fixed assets, we will use the forecast driver:

$$r = \frac{DEP}{Fixed\ assets} \tag{2. 40}$$

Where in formula (2.40), *DEP* represents depreciation, as for the future fixed assets, we can calculate as the previous fixed assets plus next year's investment, since we already get 10000 scenarios of investment, we can calculate the predicted fixed assets, then use weighted average method get weighted depreciation to fixed assets ratio, use it as constant ratio in predict years, finally we can get 10000 scenarios of depreciation for the predict years.

What's more, as we already mention, the depreciation will be lower than investment, therefore after we get the predicted depreciation, we need to compare it with investment.

**Plan of Invested capital**

The reason for predicting invested capital is preparing for the estimation of return on invested capital. We know the invested capital is equal to total capital minus current

liabilities, what's more, total capital can equal to total current assets plus total non-current assets. Because we already get predicted current assets, current liabilities when we estimate net working capital, and we can also get predicted fixed assets in the plan of depreciation, therefore we only need to predict other non-current assets, which includes goodwill and other intangible assets. Since it is difficult to predict intangible assets and goodwill, to be more conservative, we will keep it as constant value since 2017.

### 2.6 Weighted average Cost of Capital

Cost of capital can be defined, *Hitchner (2003,p.182)* as "the cost of capital (discount rate) determined by the weighted average, at market value, of the cost of all financing sources in the business enterprise's capital structure", WACC represent the cost of a company's funds which means the minimum required rate of return. From an investor's point of view, it is the required rate of return on a portfolio company's existing securities.

The formula of calculating WACC:

$$WACC = R_E \cdot \frac{E}{K} + (1 + t) \cdot R_D \cdot \frac{D}{K} \tag{2.41}$$

$$K = D + E \tag{2.42}$$

Where in formula (2.41), $R_E$ is the cost of capital of company, $E$ represents the equity of company, $E$ represents the total debt of company, $K$ represents the sum of total debt and equity, which means the capital that can create interest, $t$ is tax rate, $R_D$ is cost of debt. Next step is to estimate the key components of formula (2.41), which are cost of equity, cost of debt and weight.

#### 2.6.1 Cost of Equity

Cost of equity represents the expected rate of company's stock; we can use Capital Assets Pricing Model (CAPM) to estimate the cost of equity. *Koller (2010, p.222)* states "the CAPM is derived from the capital markets. It attempts to provide a measure of

market relationships based on the theory of expected returns if investors behave in the manner prescribed by portfolio theory." The formula of CAPM is as follows:

$$E(R_E) = R_f + \beta_t \cdot [E(R_m) - R_f] \tag{2.43}$$

Where in formula (2.43), $E(R_E)$ is the cost of equity we need, $R_f$ is risk-free rate, we usually use the return on long-term government bond as risk free rate, because the default risk is very low. $\beta_t$ is the equity's sensitivity of market, $E(R_m)$ is the expected return of market, therefore the difference between $E(R_m)$ and risk-free rate is the market risk premium.

Since we use two-stage DCF method, we will use two different risk-free rates, the risk-free rate of second stage should be higher than first stage, because different maturity has different yield, after we find the risk-free rate, we should also determine $\beta_t$, we can find the specific β for CR beer in wind-economic database.

Then we can find risk premium of specific country on website Damodaran[3].

### 2.6.2 Cost of Debt

According to *Koller (2010, p.229)*, "the actual rate a business entity pays on interest-bearing debt is the pretax cost of debt, assuming the enterprise is borrowing at the market rates." We can assume the cost of debt as the interest charge company should pay of its long-term financing borrowing. Such as if the company issue long term bond, the yield to maturity of this bond can the cost of capital of company. It can be calculated as follows formula:

$$Bond\ price = \frac{coupon}{1+YTM} + \frac{coupon}{(1+YTM)^2} + \cdots\cdots + \frac{coupon}{(1+YTM)^n} \tag{2.44}$$

Where in formula (2.44), *coupon* is the coupon that bond holder can get every year from company, *YTM* represents yield to maturity. If the company did not issue long-term

[3] http://pages.stern.nyu.edu/~adamodar/

bonds, we can get cost capital by using the long-term lending rate of bank, or we can find it on website Damodaran.

### 2.7 Return on invested capital

According to valuation formula (2.33), we should also figure out return on invested capital (ROIC) for the second stage, therefore we need to calculate historical ROIC. for the estimation of ROIC in first stage, we need to firstly predict total investment capital in first stage according to formula (2.5), since we already predict invested capital and EBIT in financial plan, we can get predicted ROIC, then I will give different weight to different years, get weighted average ROIC and regard it as ROIC for second stage.

### 2.8 Sensitivity Analysis

Sensitivity analysis is to analysis risk of valuation, every valuation has risk, we need to know what will happen in value if the parameter that influence value change. That means sensitivity analysis is to find the important influence factor on investment project from lots of uncertainty factors. Analysis and calculate its influence on project economic efficiency index and sensitivity level, and then judge the project risk. Sensitivity analysis helps to determine which risk has the biggest potential impact to the project. It kept all other uncertain factors under the condition of basic value, considering the uncertainty of each elements of project has how much impact on the target.

# 3. Basic Characteristics of the China Resource Beer Company Limited

In this chapter, we give general introduction of China Resource Beer Company Limited, includes history and company's performance in beer market, then we also analysis beer industry and main competitors of CR Beer, what's more, SWOT analysis will be applied, at last we will do financial analysis for company, which includes common size analysis and financial ratio analysis.

## 3.1 Overview of China Resource Beer Company Limited

China Resources Beer (Holdings) Company Limited, listed on The Stock Exchange of Hong Kong under the stock code 291.HK, is a beer listed subsidiary company of China Resources (Holdings) Company Limited ("CRH"). The Group focuses on the manufacturing, sales and distribution of beer products.

In 1994, CR Beer first enter China market, Its total sales volume ranked number one in the China market since 2006. The flagship brand "snow" has become the largest beer brand by volume worldwide.[4]

In 2013, CR Beer acquired Kingway Brewery, significantly enhancing its presence in Southern China.

In 2015, the Company successfully completed its business restructuring and transformed itself into a beer-focused enterprise, and was renamed from "China Resources Enterprise, Limited" ("CRE") to "China Resources Beer (Holdings) Company Limited".

In October 2016, the Company completed the acquisition of 49% stock of China Resources Snow Breweries Limited ("CRSB"), which became a wholly-owned subsidiary of the Company.

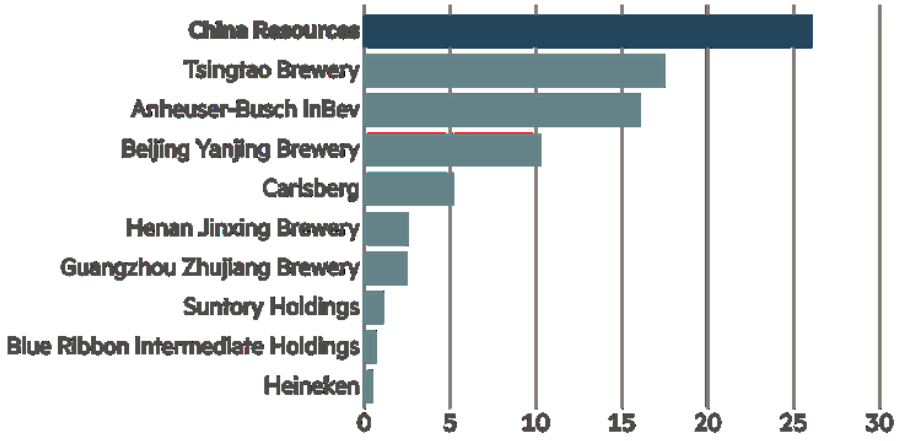
[4] http://www.crbeer.com.hk/home/aus/company/

In 2017, company continued to make steady progress in business, while striving to accelerate its transformation and upgrade by implementing strategic measures such as innovative development and marketing, capacity optimization and efficiency improvement. We will use “CR beer” to represent China Resource Beer Company Limited.

### 3.2 Main competitor in Chinese market

Although CR Beer has obtained lots of consumers in Chinese beer market, there still exist strong competitors, most of them are shown in the following figure.

Figure 3.1 Market share of China’s most popular beer in 2017 (Unit: %)




Source: https://www.euromonitor.com/beer-in-china/report

Figure 3.1 shows main competitors in beer industry, we can see CR Beer account for the largest market shares, then is Tsingtao, these two companies hold over 40% of the Chinese market.

As a relative newcomer founded in the early 1990s, China Resources Beer quickly rose to overtake established rivals such as Tsingtao, taking the top position by exclusively pursuing a low-cost strategy. It grew by winning customers in rural areas, buying up local companies that had products mainly in the lower price range. As a result, its lineup of products normally cost 2 yuan to 3 yuan per 500ml bottle.

This was not a problem when the Chinese economy was thriving, and the beer market was expanding steadily year by year. But after growth began slowing and the market peaked in 2013, China Resources Beer posted a net loss in the year ended December 2015. It was forced to sell its slumping retail business and focus on beer production in the following year, but profits still dropped. The shrinking market also hit Tsingtao, whose revenue and profit fell for the second consecutive year through December 2016.

The beer market shrank for the fourth consecutive year in 2017, but both companies managed to increase revenues and profits thanks to improved sales in products in the medium and higher price ranges, suggesting their strategy shifts are paying off.

### 3.3 SWOT Analysis of China Resource Beer Company Limited

In this part, SWOT Analysis will be applied, which includes analyzing strength, weakness, opportunities and threats of company, it makes it possible for CR Beer to identify the positive and negative influencing factors inside and outside of the company.

Firstly, analyzing the internal potential, which includes the strengths and weaknesses.

**Strengths**

- Complete product line

Good brand awareness, it is the leader of beer industry, products are diversified, there are different product target different consumer market, in recent years, company launch “super X”, which target to high-end group.

- Promotion activities

CR beer also launched some promotion activities, such as “Brave Adventure Activities”, which is original brand promotion activities, the content is polar exploration like canyon and desert. It was not only a nationwide brand promotion activity which has large-scale and wide area, but also a unique cultural spread to give back to Chinese beer lovers.

- Irreplaceable Heritage Brands and Well-recognized international brand

Snow (“雪花”) is the world’s largest selling beer brand by volume, company will form a strategic collaboration with the Heineken Group (subject to customary and applicable (including regulatory) approval) to expand into China’s premium market. Nationwide presence operating 78 breweries in 24 out 34 provinces in China.

- Proven Management Leadership

There are many experienced management team members who works in CR Beer for many years. Sponsorship from one of the leading SOEs in China.

Secondly, we will analysis the external potential, which includes the opportunities and threats.

**Weakness**

- Materials price greatly influence cost

Materials such as malt, hops, water, beer yeast, will priced based on the harvest, but materials price is volatile and difficult to predict, it will greatly influence the cost of good, therefore the final product pricing will also be influence, higher product price will result in consumer losing.

**Opportunities**

- Gradual improvement of policies and regulations

Under the influence of policies and regulations, China's beer enterprises began to develop in the direction of branding, which means pay more attention to quality, not quantity, and the implementation of product structure optimization adjustment, to better satisfy consumer demand. In addition, China has also implemented a series of regulations on production and environmental protection, thus there are higher requirements for enterprise production, requiring the beer industry strengthen environmental awareness and promote safe production in the production process, so that the industry can achieve healthy development, For this reason, the cost of beer enterprises in the actual production

process has been virtually increased, in the short term, which affects the economic benefits of enterprises, but in the long run, this helps enterprises to achieve healthy development, and improve in the production level.

- Living environment changes

As pace of life is getting quicker, the pressure of competition make people has more work stress, drink beer is a good way to release pressure, on the other hand, because of the macroeconomic factor, such as urban population become larger, GDP increase, the consumption also increases.

- The Undisputed Leader in World's Most Attractive Beer Market

CR Beer rank first in China's beer industry for the past 12 years with 26.8% market share1 vs. 18.1% for the next player in 2017

**Threats**

- Low-price competition

Because the most popular beer in China is cheap beer, although different company have different product, these products are very similar, what's more, consumer loyalty is low, therefore consumer prefer to choose beer which has lower price, therefore lower price will create more sales volume, but low-price competition will cause vicious circle, every company has its own cost of sales and other cost, in order to obtain higher market share, some companies will sacrifice its product quality to meet lower product cost, it is not a positive competition.

- New competitor enter market

Not only China beer competitor, but also foreign competitor enter Chinese market, China's high-end market is now receive a lot of imported foreign beer enterprises' attention, in recent years China's beer market, many imported foreign beer brands have fast develop speed, although they accounted for a small proportion in the overall industry, but their accelerated growth trend cannot be ignored.

- Material supplies unstable

CR Beer has a strict screening in materials which include malt, hops, water, beer yeast, due to the asymmetry of development of China's beer industry and the development of its raw material industry, with the introduction of the State Council on the prohibition of foreign garbage entry, clearly state that the import of waste paper, plastics must be strict regulated, packaging bottles, package paper and other cost growth, which bring new challenges to the enterprise packaging transformation.

- Culture differences

There are so many cities in China, different region has different food culture, some regions prefer Chinese liquor, some prefer Jin wine, what's more, there exist some local beer brands which has higher consumer loyalty than CR beer.

### 3.4 Financial Analysis of China Resource Beer Company Limited

This part will use common size analysis and financial ratio analysis to help us deeply understand the real situation of company. We will analysis important items in financial statement and key financial ratio during 2008 to 2017.

#### 3.4.1 Common size analysis of China Resource Beer Company Limited

We will analysis important items of Balance sheet, cash flow statement and income statement from 2008 to 2017, which can clearly state the financial situation of CN beer.

**General situation of Balance sheet**

The first part is the general situation of the balance sheet of CN beer from 2008 to 2017. In this part, the tendency of the main components of the balance sheet which include total assets, total liabilities and total equities and the reasons causing them will both be discussed.

Figure 3.2 Three main components of Balance sheet from 2008 to 2017(Unit: million yuan)

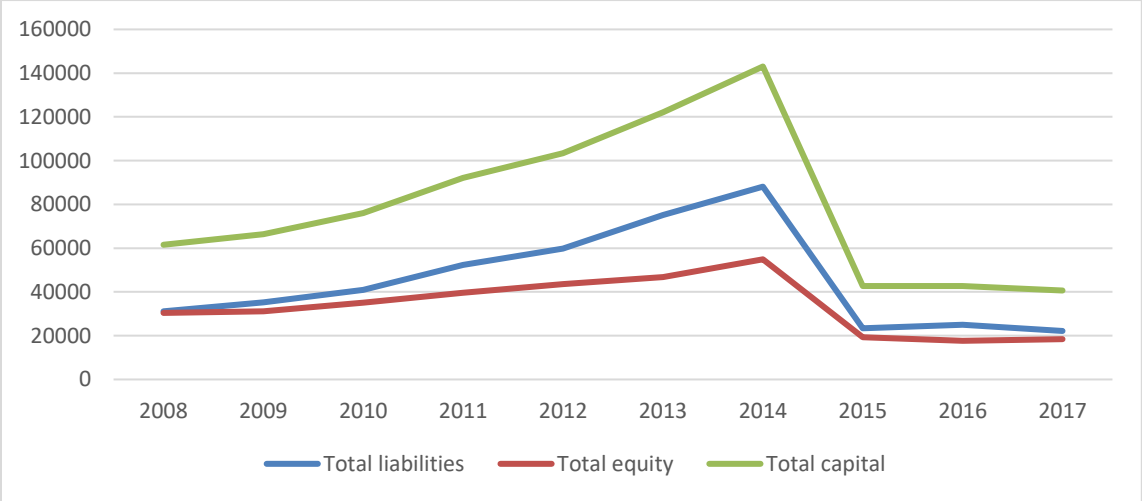



Figure 3.2 shows that total capitals, total liabilities and total equity of company have been increasing during 2008 to 2014, then total capital, total liabilities and total equity started to sharply decrease in 2015, the reason is that CR beer discontinue some businesses because of macro environment, including retail, food and beverage businesses, only kept beer businesses which was the most profitable and promising businesses. Then since 2015, total assets had decreased a little bit, total assets and total capital were relatively stable. It means the transformation is successful, company's financial situation begins to keep stable.

**General situation of Income statement**

The second part is the general situation of the income statement of CN beer from 2008 to 2017. In this part, the most important components of the income statement, those are the gross margin and net income, are analyzed by using the horizontal analysis method, then we will explain reasons.

Figure 3.3 Main components of Income statement from 2008 to 2017(Unit: million yuan)

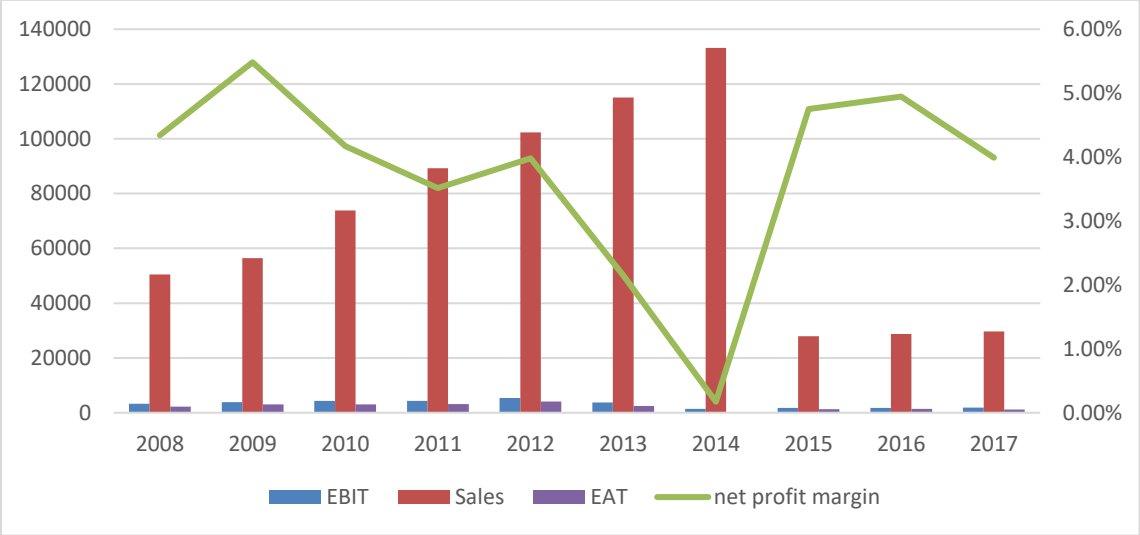
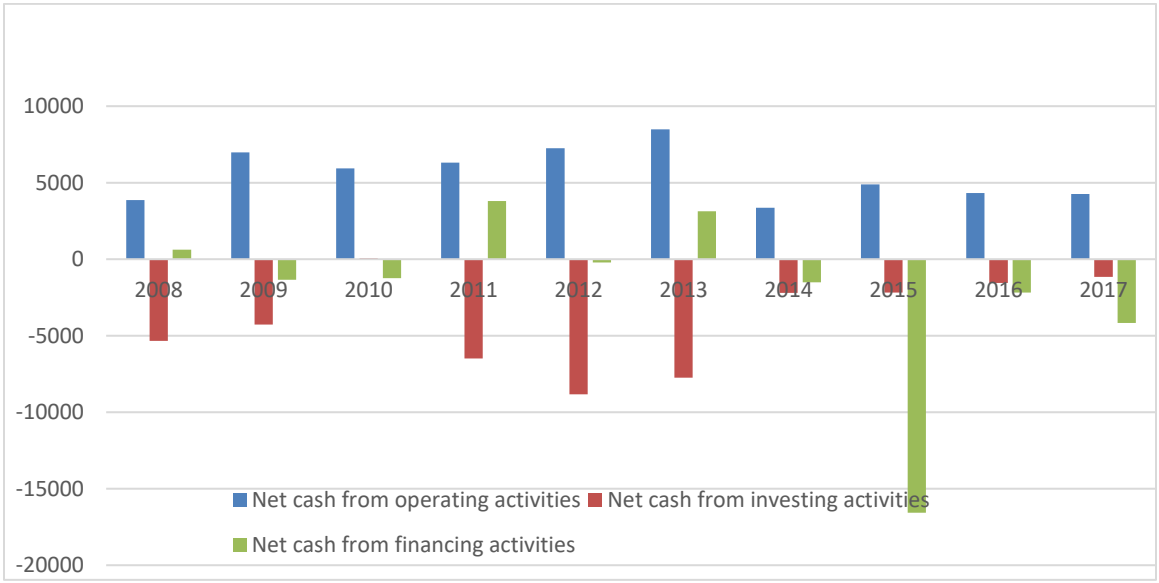



Figure 3.3 shows the change of sales, EBIT and EAT, sales, had increased steady during 2008 to 2014, as for EBIT and EAT, they had increased from 2008 to 2012, then decreased by 30% in 2013 because of the increasing of cost and expenditures, then continually decreased by 64% in 2014 because of the increasing of cost of sales, therefore company decided to make a transformation, that is the reason why total sales decreased sharply in 2015, after transformation, sales have kept increasing, EBIT decreased a little bit in 2016 then increased in 2017, EBT increased 2016, then decreased in 2017 for the reason of highly tax and financial cost, there also shows net profit margin, it is the ratio between EAT and sales, we can see the tendency is volatile, especially in 2014, the net profit margin reached bottom, after transformation, net profit margin increased to 4.9% in 2016, then decrease to 4% in 2017.

**General situation of Cash flow statement**

The third part is the general situation of the cash flow statement of CN beer from 2008 to 2017. In this part, the cash flow from the three major activities and the general cash flow of each year are analyzed.

Figure 3.4 General information of the cash flow statement (Unit: million yuan)




See from Figure 3.4, the net cash flow from each activity has dramatically change, for the net cash from operating activities, it is always positive, the main reasons for increasing and decreasing lie in the change of cash generated from operating activities and Chinese Mainland income tax paid, in recent three years after transformation, the net cash flow become relatively stable, it has slightly decreased but kept above 4000.

For the net cash from investing activities, it was usually negative except in 2010, because CN beer dispose subsidiaries in 2010, that is the reason why there was a huge cash inflow in 2010, then after transformation in 2015, the net cash from investing activities has been increasing because of the decreasing of purchasing of fixed assets.

For the net cash from financing activities, company paid 12243.7 million-yuan dividends to shareholders in 2015, this caused a big cash outflow, then in 2016, company issued new stocks and lend money from a holding company, cash inflows increased, then company repaid its loan to a holding company, therefore cash outflow increase in 2017.

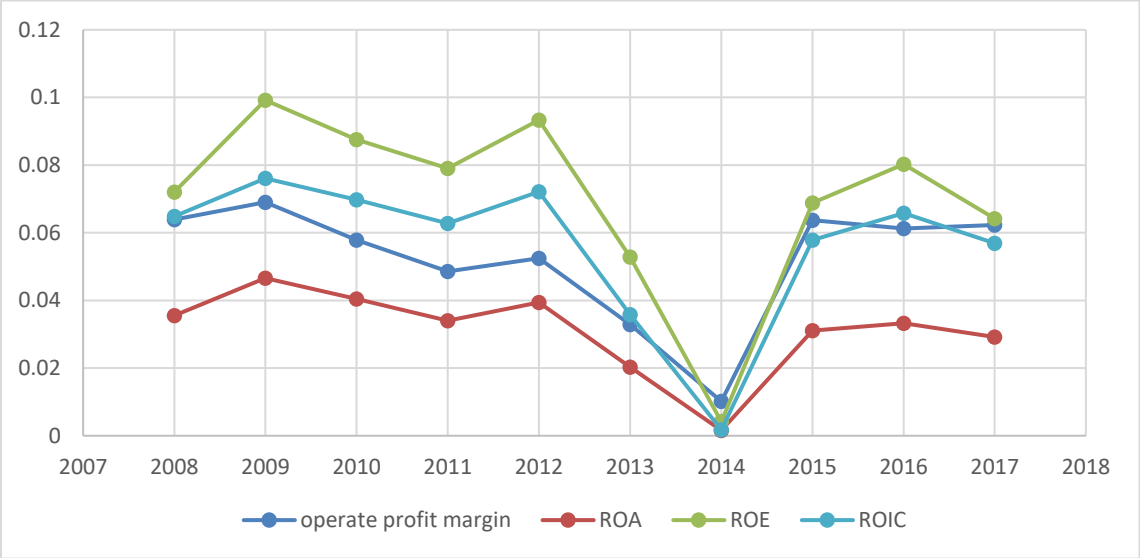
### 3.4.2 Financial ratio analysis of China Resource Beer Company Limited

This part we will use the formula which already be introduced in Chapter two to calculate financial ratio, we will analysis from four types of basis ratios of CR beer, they include profitability ratio, liquidity ratio, solvency ratio and activity ratio.

**Profitability ratio**

Profitability ratio can reflect the ability for the company to earn money. We can see three ratio of profitability ratio in the following figure.

Figure 3.5 Profitability ratio




From Figure 3.5, we can see from 2009 to 2011, the operating profit margin has decreased, it means earing per product become lower during 2009 to 2011, on the other hand, because global financial crisis in 2008, *ROA* and *ROE* also decreased during 2009 to 2011, the operate profit margin reached lowest in 2014, because the cost of sales, general and administrative expenses increased a lot in 2014, then operating profit margin had increased from 2014 to 2016, because company has transformed to a pure beer selling company in 2015, moreover, beer is the most profitable business for CR beer, therefore operating profit margin increased, what's more, we can say transformation is successful, then in 2017, CR beer spent much money in developing and researching, the

operate profit margin decreased, all in all, after transformation, the operating profit margin is stable above 6%.

We can see from the Figure 3.5, *ROA* had decreased in general during 2009 to 2014, it means one unit of asset has lower value than before, the reason is that the cost and expenses had been increasing during 2009 to 2014, then reached lowest in 2014, after the transformation in 2015, *ROA* has increased since 2015, It keeps stable around 3% after transformation, it means one unit of assets create higher value than before, it is a good financial situation.

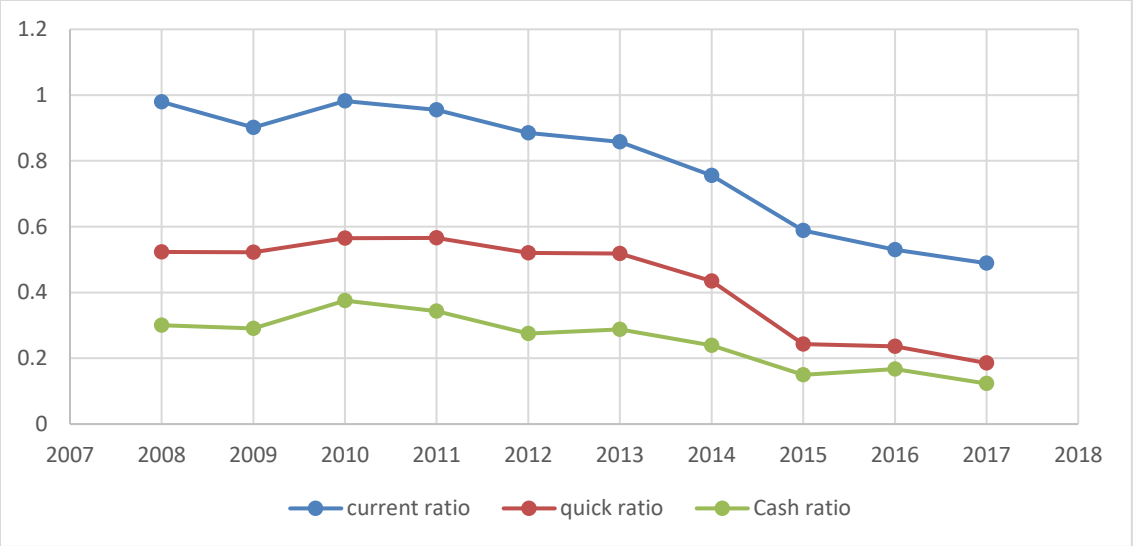
The trend of *ROIC* is also fluctuated, it can reflect the expected rate of return for the company, it decreased to the bottom in 2014, the reason result in the lowest revenues of 2014, after the transformation in 2015, it has become stable around 6%, which is not a very high ratio, we will compare it with weighted average cost of capital in Chapter 4, then make some comments.

*ROE* is similar with *ROIC* but is more dramatic. We can see from the Figure 3.5; *ROE* had decreased during 2009 to 2014 except in 2012. It means that the investments of company were creating lower profit, then after the transformation in 2015, *ROE* increased from 0.42% to 6.8% in 2015 which is a huge increase, although it is better for *ROE* to be high, a higher *ROE* does not necessarily mean better financial performance of the company. We should also consider about the risk of equity, from other perspective, in the DuPont formula, *ROE = net profit margin · asset turnover · financial leverage*, which shows that the higher *ROE* can be the result of high financial leverage, high financial leverage is dangerous for a company's solvency, this is because the financial leverage is measured as the ratio of total debt to total assets, in other words, the greater the amount of debt, the greater the financial leverage. We already mentioned that company issued new stock and lend money from a holding company in 2016, therefore the financial leverage becomes higher than previous years.

**Liquidity ratio**

Liquidity ratio can reflect the ability for the company pay its short-term liabilities. We can see three ratio of liquidity ratio in the following figure.

Figure 3.6 Liquidity ratio




The current ratio is the ratio between current assets and current liabilities, from 2008 to 2017, the current ratio is always lower than 100% which means the values of current assets is always lower than current liabilities, and it had been decreasing, this is not a good signal for company, with higher current liabilities and lower current assets, CR beer cannot pay their short-term liabilities in short run.

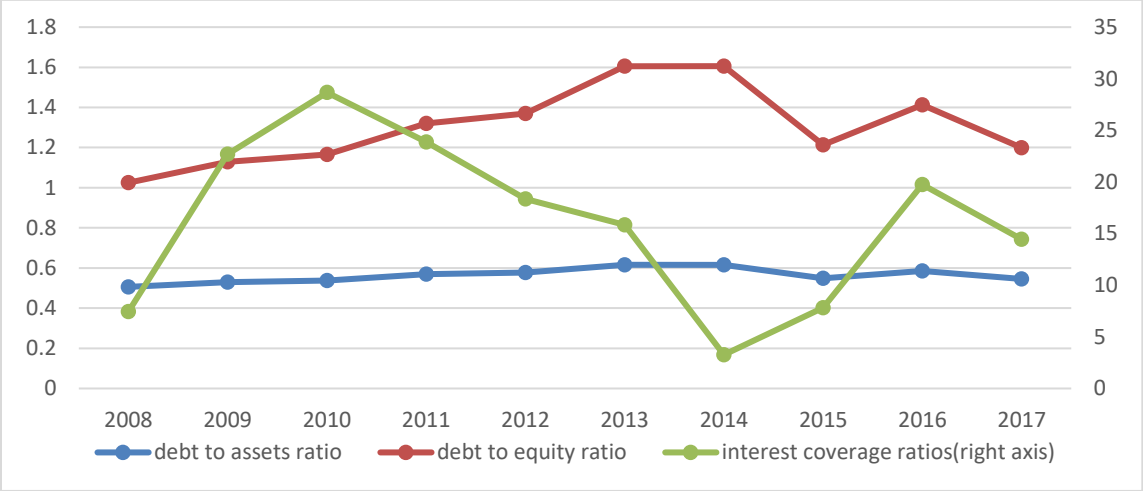
Quick ratio is the ratio between current assets minus inventories and current liabilities, it can show one company's cash ability, from Figure 3.6, the trend of quick ratio is similar with current ratio, it had been decreasing and lower than 60%.

Cash ratio is the ratio between cash and current liabilities, is the most conservative in three ratios, seeing from the chart above, we can know that the liquidity of CR beer is not so good, for investors, it is risky to invest in CR beer.

**Solvency ratio**

Solvency ratio can reflect the ability for the company to pay its long-term liabilities. We can see three solvency ratios in the following figure.

Figure 3.7 Solvency ratio




Debt-to-assets ratio had been increasing during 2008 to 2014 from 51.6% to 61.6%, then it kept stable around 55% in recent three years, which means total debt account for 55% of total assets, total debt is not so large.

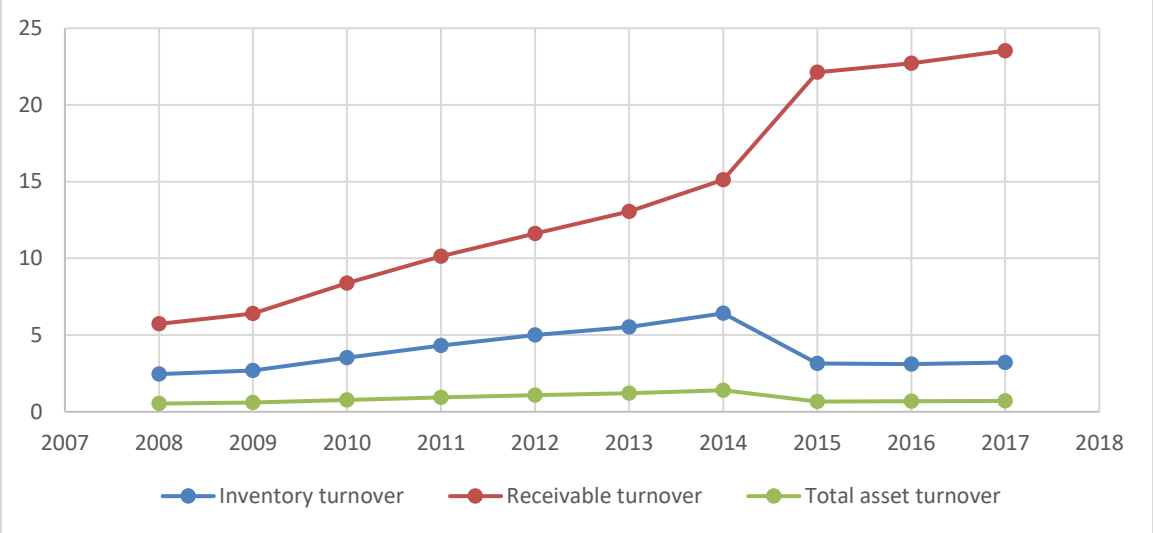
Debt-to-equity ratio has higher volatility compared with Debt-to-assets ratio, it reflects the ability of shareholder equity to cover all outstanding debts in the event of a business downturn. and the ratio is always higher than 100%, it means that total debit is always higher than total equity, higher debt-to-equity ratio means shareholders will face higher risk. What's more, it will affect CR beer's credit rating, making it more expensive to raise fund.

Interest coverage ratio, it is the ratio between EBIT and interest paid, this ratio can shows the ability of CR beer to pay its interest, the higher the ratio, the better, we can see from the above figure, interest coverage ratio increase sharply in 2010, because interest paid is low compare with previous years, then it decreased in 2014 and increase again during 2014 to 2016. It means CR beer's ability to cover its interest expense is becoming better compared with previous years, but in 2017, the interest coverage ratio decreased from 19.7 times to 14.5 times, because it is still very high, therefore we can state that CR beer can cover it interest charge very good.

**Activity ratio**

We will calculate inventory turnover, receivable turnover and total assets turnover. We can see these turnovers of activity ratio in the following figure.

Figure 3.8 Activity ratio




Inventory turnover can reflect the times of selling inventory of CR beer in one year. The inventory turnover had increased from 2008 to 2014, then decreased from 6.4 to 3.1 in 2015, it means the risk of inventory overstock and loss is very high in this year, then it kept above 3.2, in 2017 it increased by 0.1%.

The receivable turnover can reflect the average time for CR beer to collect account receivable, from Figure 3.8, we can obviously see an increasing of receivable turnover, it means company operates on a cash basis and collection of accounts receivable is efficient.

Total assets turnover can reflect the ability for CR beer to effective use assets to realize market sell. It had increased from 0.53 in 2008 to 1.4 in 2014, it this situation, efficiency of sales of goods had been increasing, then decreased to 0.67 in 2015, after the transformation in 2015, assets turnover kept increasing.

In conclusion, we can state that transformation in 2014 is a wisely decision, it helped CR beer limit its loss, after transformation, *ROA* of CR beer increased, profitability of company increased in general, but the liquidity of CR beer is still worse, it could be the

result of transformation, because transformation cause large cash outflow, for example expenses for research and development. This will cause the current assets decreased sharply. The solvency situation of CR beer is good, the activity ratio behaved very well after transformation.

# 4. Estimation of the Expected Market Value of the China Resource Beer Company Limited

This chapter is the application part of thesis, in this part we will apply the methods and models which have been explained in theoretical part. Firstly, we will use regression analysis to regress out the sales function of China resources beer, secondly, we will use Monte Carlo Simulation to predict independent variables in 5 years, we create 10000 scenarios, then we can get sales according to the sales regression function from 2018 to 2022. After that, we will make financial plan for CR beer. Calculate the value of CR beer by using two-stage DCF method. Finally, we will do sensitivity analysis to make distribution of results and make some summary.

## 4.1 Sales revenue prediction

In this subchapter, we will use ordinary least square method to get the regression function of sales revenues. First, we should find some items that can influence the sales of beer, then we will calculate the correlation of logarithmic returns between independent variables, next is to use Monte Carlo Simulation to simulate 10000 scenarios random numbers to predict the independent variables, finally we can get the predict sales.

### 4.1.1 Sales revenues regression

Sales of beer can be influenced by many factors, we cannot list all of them, therefore we choice some important factors that influence the beer's sales, these data are collected from China national statistic and wind-economic fee-based database. they are the independent variables of regression function, sales of beer are the dependent variable, we will choose two of them as the independent variables of regression model, the independent variable we chose must fulfill the standard of regression model, compared different scenarios, we can find out the property scenario, and get the regression model.

Table 4.1 Input data for calculation

| | Sales of beer | Average wage in urban | Consumption level | GDP | Number of restaurants | Male population | Number of automobiles | Urban population | Number of university students | Wheat output |
|---|---|---|---|---|---|---|---|---|---|---|
| Unit | million yuan | yuan | yuan | billion yuan | | million | million | million | | million tons |
| 2004 | 5403 | 9422 | 5138 | 15988 | 10067 | 670 | 15 | 543 | 7378436 | 92 |
| 2005 | 7133 | 10493 | 5771 | 18494 | 9922 | 674 | 21 | 562 | 8488188 | 97 |
| 2006 | 9503 | 11760 | 6416 | 21631 | 11822 | 677 | 27 | 583 | 9433395 | 108 |
| 2007 | 12434 | 13786 | 7572 | 26581 | 14070 | 680 | 35 | 606 | 10243030 | 110 |
| 2008 | 15348 | 15781 | 8707 | 31405 | 22523 | 684 | 44 | 624 | 11042207 | 113 |
| 2009 | 16618 | 17174 | 9514 | 34090 | 20694 | 686 | 57 | 645 | 11798511 | 116 |
| 2010 | 18280 | 19109 | 10919 | 40120 | 21595 | 687 | 75 | 670 | 12656132 | 116 |
| 2011 | 21572 | 21810 | 13134 | 48412 | 22496 | 691 | 93 | 691 | 13496577 | 119 |
| 2012 | 22682 | 24565 | 14699 | 53412 | 23390 | 694 | 113 | 712 | 14270888 | 123 |
| 2013 | 25816 | 26955 | 16190 | 58802 | 26743 | 697 | 135 | 731 | 14944353 | 124 |
| 2014 | 27118 | 28844 | 17778 | 64397 | 26634 | 701 | 159 | 749 | 15410653 | 128 |
| 2015 | 27959 | 31185 | 19397 | 68905 | 25947 | 704 | 183 | 771 | 15766848 | 133 |
| 2016 | 28694 | 33616 | 21285 | 74359 | 26359 | 708 | 210 | 793 | 16129535 | 133 |
| 2017 | 29732 | 36396 | 22902 | 82075 | 25884 | 711 | 236 | 813 | 17225103 | 134 |

Source: http://www.stats.gov.cn/english/ wind-economic database

Where in Table 4.1, source of sales of beer are collected from the annual report of CR beer, other variables are collected from national database. These data are used for the data analysis to build the regression model, the data from Table 4.1 includes:

**Sales**: because the company we choose only sell beers, we can also call it sales of beer, it is the turnover of beer, the higher the better.

**Average wage in urban**: it is the salary of urban area, because urban area is most developed, the consumption is greater than village, therefore we choose this factor, the higher wage will lead higher consumption, it has positive relationship with sales of beer.

**Consumption level**: this can reflect the life level of Chinese, the higher consumption level will lead higher sales of beer, therefore it has positive relationship with sales.

**GDP**：GDP is the gross domestic product of China, it is the most important factors of economy, the higher GDP means the higher production, therefore GDP has positive relationship with sales.

**Number of restaurants**: because beers are mainly sold in restaurants, therefore we can assume that greater restaurants will contribute to higher beer's sale, the have positive relationship.

**Number of males**: because in China, compared with females, males are more likely to drink beer, therefore we can assume there has positive relationship between number of males and sales of beer.

**Number of automobiles**: in China's transportation law, it is prohibited that driving after drinking, if one bought a car, the frequency of drinking will decrease, therefore we can assume the number of cars have negative relationship with sales of beer.

**Urban population**: because urban area has higher consumption level, more people in urban area will also increase the sales of beer, therefore we can assume the urban population has positive relationship with sales of beer.

**Number of university students**: young people are more likely to drink beers, therefore more university students can contribute to more sales of beer, therefore we assume number of university students has positive relationship with sales of beer.

**Wheat output**: because the mainly material of beer is wheat, it is also an important factor to influence sales, therefore we can assume there is a positive relationship between wheat output and sales of beer.

After we collect independent variables, we can regress the function. The steps are: input data in Stata→use function: regress $y\ x_1\ x_2$→press enter.

In Stata, we put input data of sales as $y$, nine independent variables as $x_i$, and confidence level is 95%, because we have nine different variables, we will choose two of them to build a regression model, it means we have 36[5] scenarios, through p-vale and $R^2$, we can find the best fit regression function of sales, p-value of proper sales regression must be smaller than 0.05 due to 95% confidence level, and higher $R^2$ also means the better model we create, and the relationship we mentioned between independent variables and dependent variable must be adapt to economic situation. Because we cannot present all of them in thesis, we will choose three of them, they are shown as follow:

Table 4.2 Regression scenario one

```
. regress sales GDP consume
```

| Source | SS | df | MS | Number of obs | = | 14 |
|---|---|---|---|---|---|---|
| | | | | F(2, 11) | = | 369.27 |
| Model | 886901282 | 2 | 443450641 | Prob > F | = | 0.0000 |
| Residual | 13209589.9 | 11 | 1200871.81 | R-squared | = | 0.9853 |
| | | | | Adj R-squared | = | 0.9827 |
| Total | 900110872 | 13 | 69239297.8 | Root MSE | = | 1095.8 |

| sales | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| GDP | 1.473474 | .2583513 | 5.70 | 0.000 | .9048465 | 2.042101 |
| consume | -4.026876 | .9442153 | -4.26 | 0.001 | -6.10508 | -1.948672 |
| _cons | 3552.516 | 773.7067 | 4.59 | 0.001 | 1849.599 | 5255.433 |

[5] We choose 2 independent variables from 9, therefore methods are:9*8/2=36.

From Table 4.2, we can get result that the R-squared is 0.9853, it is very high, it means this regression model can explain 98.53% of input data, where α=0.05, p-values are lower than 0.05 for all variables, therefore these two variables are statistically significant. But there is a positive relationship between sales and consumption level. The coefficient of consumption level is -4.027 and this value is not fitted with economic situation, therefore we cannot use regression scenario one.

Table 4.3 Regress scenario two

```
. regress sales undergraduate wage
```

| Source | SS | df | MS | Number of obs | = | 13 |
|---|---|---|---|---|---|---|
| | | | | F(2, 10) | = | 1220.43 |
| Model | 776648631 | 2 | 388324316 | Prob > F | = | 0.0000 |
| Residual | 3181858.56 | 10 | 318185.856 | R-squared | = | 0.9959 |
| | | | | Adj R-squared | = | 0.9951 |
| Total | 779830490 | 12 | 64985874.2 | Root MSE | = | 564.08 |

| sales | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| undergraduate | .0023665 | .000281 | 8.42 | 0.000 | .0017405 | .0029925 |
| wage | .1443337 | .1004986 | 1.44 | 0.181 | -.079591 | .3682585 |
| _cons | -13904.72 | 1539.976 | -9.03 | 0.000 | -17336 | -10473.44 |

From Table 4.3, the R-squared is 0.9959, it is very high, it means this regression model can explain 99.59% of input data, where α=0.05, p-value of average wages in urban is 0.181 which is higher than 0.05, therefore we can say that one variable is not statistically significant. Therefore, we cannot use regression scenario one.

Table 4.4 Regression scenario three

```
. regress sales restaurants urban
```

| Source | SS | df | MS | Number of obs | = | 14 |
|---|---|---|---|---|---|---|
| | | | | F(2, 11) | = | 1043.00 |
| Model | 895389256 | 2 | 447694628 | Prob > F | = | 0.0000 |
| Residual | 4721615.71 | 11 | 429237.792 | R-squared | = | 0.9948 |
| | | | | Adj R-squared | = | 0.9938 |
| Total | 900110872 | 13 | 69239297.8 | Root MSE | = | 655.16 |

| sales | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| restaurants | .3780027 | .0705062 | 5.36 | 0.000 | .2228196 | .5331857 |
| urban | 69.16015 | 5.122178 | 13.50 | 0.000 | 57.88631 | 80.43399 |
| _cons | -35514.68 | 2233.206 | -15.90 | 0.000 | -40429.94 | -30599.43 |

From Table 4.4, we can get result that the R-squared is 0.9948, it is nearly close to 1, it means this regression model can explain 99.48% of input data, where α=0.05, p-values are lower than 0.05 for all variables, therefore these two variables are statistically significant. On the other hand, there is a positive relationship between sales and number of restaurants and urban population. The coefficient is positive, then we can use regression scenario three.

According to regression scenario three, we can get the regression model, the model can be described as:

$$Sales = -35514.68 + 0.378res + 69.16urb \quad (4.1)$$

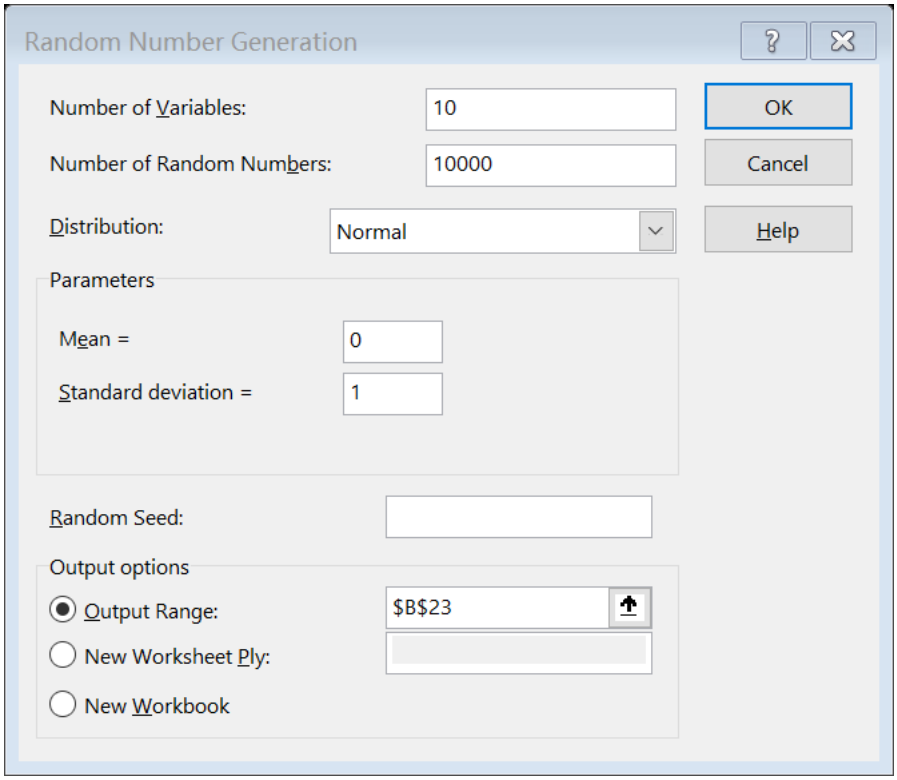
Where in function (4.1), *Sales* is the sales of beers (unit: million yuan), *res* is the number of restaurants, *urb* is the urban population (unit: million), we can know from this function that the increase of urban population and restaurants will increase sales of beer.

### 4.1.2 Monte Carlo Simulation & Cholesky decomposition

In order to predict future sales of beer, Monte Carlo Simulation will be used to predict the independent variables. First, we need to create random variables. The steps to create random variables in Excel : Data →Data Analysis→ Random Number Generation.

In order to make our result more accurate, we choose to create 10000 random numbers, because more scenarios we make, result will be more accurate. Then we have two independent variables and we need to predict 5 years independent variables; therefore, we should generate 10 random variables to support calculation. And we will make our random variables distributed normally.

Figure 4.1 Random number generation in Excel




After we put all condition into the box, we press ok, then we get 10000 random variables, these variables obey normal distribution.

Next step is to calculate the correlation between logarithmic return of independent variables, if correlation is very high, we need to adjust the normal distributed random

number to proper correlation by using Cholesky Decomposition, if correlation is low, we do not need to use Cholesky Decomposition.

Table 4.5 Logarithmic returns

| | logR(urban) | logR(res) |
|---|---|---|
| 2005 | 0.03492 | -0.01451 |
| 2006 | 0.03627 | 0.17521 |
| 2007 | 0.03944 | 0.17408 |
| 2008 | 0.02877 | 0.47049 |
| 2009 | 0.03324 | -0.08469 |
| 2010 | 0.03751 | 0.04262 |
| 2011 | 0.03089 | 0.04088 |
| 2012 | 0.02999 | 0.03897 |
| 2013 | 0.02674 | 0.13396 |
| 2014 | 0.02439 | -0.00408 |
| 2015 | 0.02894 | -0.02613 |
| 2016 | 0.02790 | 0.01575 |
| 2017 | 0.02551 | -0.01818 |

After we get logarithmic return, we can use Excel function to get the correlation, the steps are: *Data→Data analysis→Correlation, the correlation matrix is following:*

Table 4.6 Correlation between logarithmic returns

| | logR(urb) | logR(res) |
|---|---|---|
| logR(urb) | 1 | |
| logR(res) | 0.09563 | 1 |

From Table 4.6, we know that the correlation between logarithmic returns is 0.096, it is small, therefore it is no necessary to use Cholesky Decomposition. The next step is to check the correlation between random number we created.

Table 4.7 Correlation between random number from 2018 to 2022

| | 2018urb | 2018res |
|---|---|---|
| 2018urb | 1 | |
| 2018res | 0.01291 | 1 |

| | 2019urb | 2019res |
|---|---|---|
| 2019urb | 1 | |
| 2019res | 0.00848 | 1 |

| | 2020urb | 2020res |
|---|---|---|
| 2020urb | 1 | |
| 2020res | -0.00457 | 1 |

| | 2021urb | 2021res |
|---|---|---|
| 2021urb | 1 | |
| 2021res | 0.02769 | 1 |

| | 2022urb | 2022res |
|---|---|---|
| 2022urb | 1 | |
| 2022res | -0.01494 | 1 |

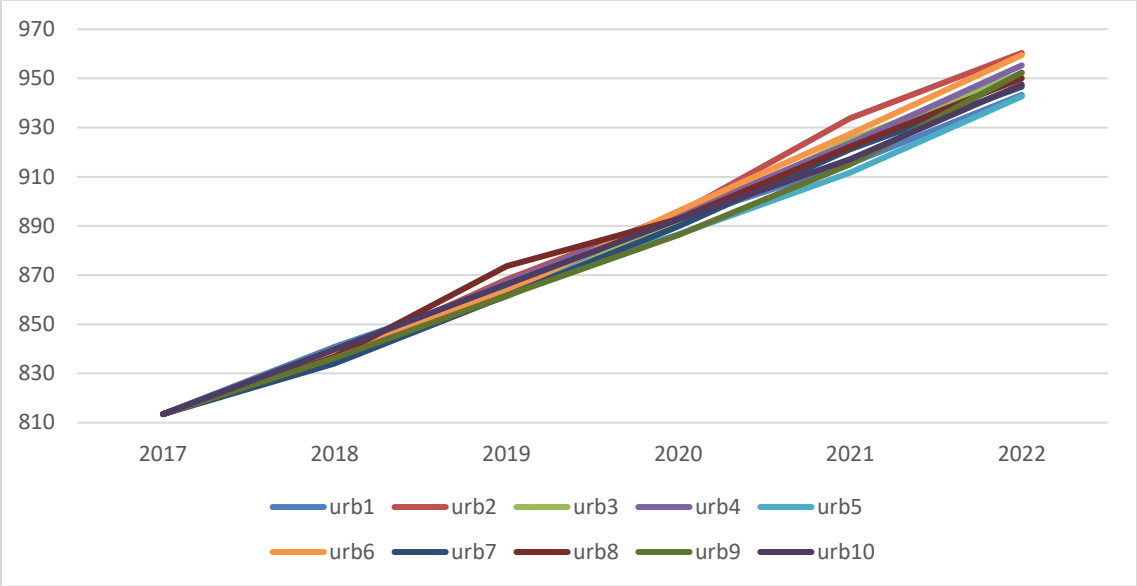
From Table 4.7, we can see all correlation of random numbers are very small and differentiated, therefore we can accept the random variables. Then we use Geometric Brownian Motion to predict the urban population and number of restaurants, the key parameter we need is following

Table 4.8 Mean and standard deviation

| | logR(urban) | logR(res) |
|---|---|---|
| μ | 0.03112 | 0.07264 |
| σ | 0.00459 | 0.13739 |
| α | 0.03110 | 0.05377 |

We can use formula (2.26)： $S_t = S_{t-1} \cdot exp(\alpha \cdot \Delta t + \sigma \cdot \tilde{z} \cdot \sqrt{\Delta t})$ to calculate the independent variables, $\Delta t$ is 1, $\tilde{z}$ is random number, then we can get 10000 scenarios, we pick 10 of 10000 scenarios to show the trend.

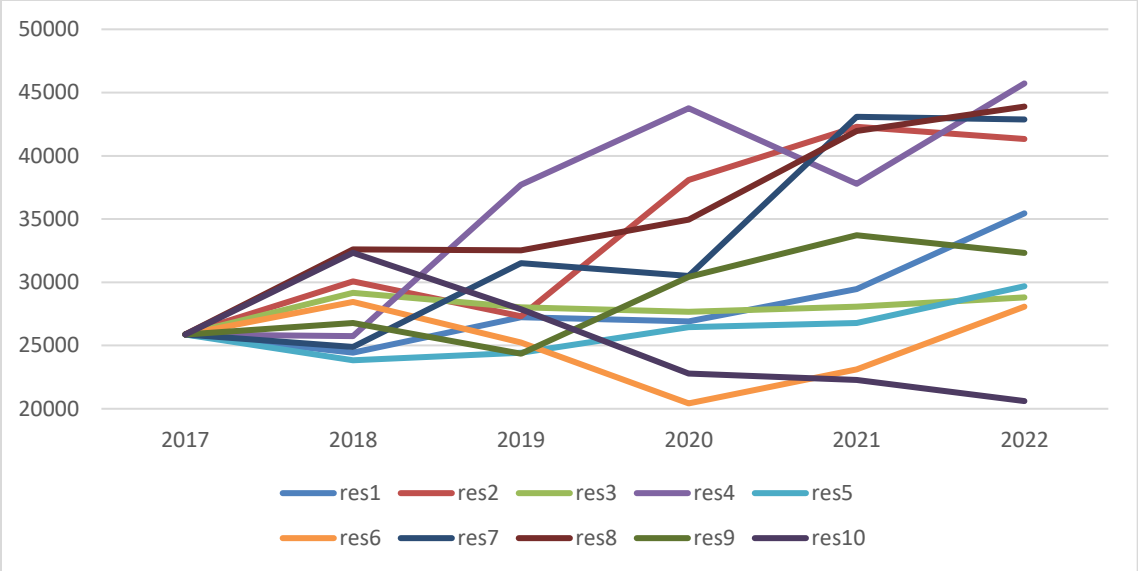
Figure 4.2 Estimated future urban population (unit: million)




From Figure 4.2, we can state that the trend of urban population is increasing. The reason for the continuously increasing trend is that the standard deviation of urban population is very small, it is 0.004, it causes the predicted urban population continuously increasing without volatility.

Then we use the same way to calculate the number of restaurants, we can also get 10000 scenarios, we will also show 10 of them, they are as follows:

Figure 4.3 Estimated future number of restaurants




From Figure 4.3, we can state that the number of restaurants has many different trends in next five years, but in general most of data have an increasing trend. Finally, according to the regression function (4.1), we can get results of sales.

Figure 4.4 Samples of sales prediction (unit: million yuan)

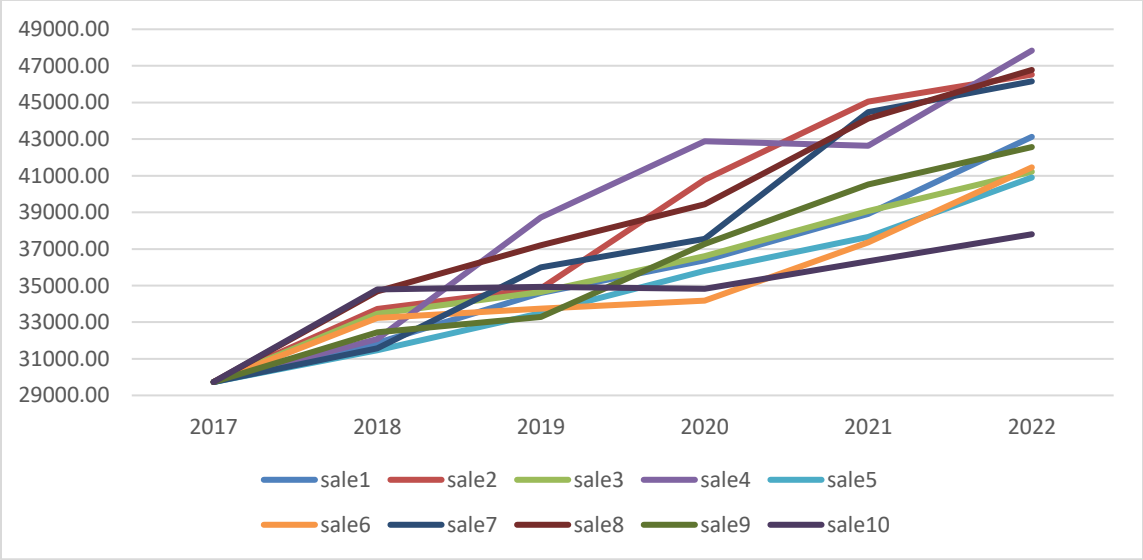



Figure 4.4 shows 10 of 10000 scenarios, 10000 scenarios can regard as different risks for company, we can get result that these 10 scenarios has trend of increasing and it goes independently.

Table 4.9 Valuation frequency (Unit: million yuan)

| | 2018 | | 2019 | | 2020 | | 2021 | | 2022 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Interval | Frequency | probability | Frequency | probability | Frequency | probability | Frequency | probability | Frequency | probability |
| 25495 | 1 | 0.01% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| 26906 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| 28317 | 0 | 0.00% | 1 | 0.01% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| 29728 | 51 | 0.51% | 3 | 0.03% | 1 | 0.01% | 0 | 0.00% | 0 | 0.00% |
| 31139 | 924 | 9.24% | 97 | 0.97% | 6 | 0.06% | 1 | 0.01% | 0 | 0.00% |
| 32550 | 3170 | 31.70% | 648 | 6.48% | 81 | 0.81% | 4 | 0.04% | 0 | 0.00% |
| 33960 | 3544 | 35.44% | 1788 | 17.88% | 423 | 4.23% | 50 | 0.50% | 4 | 0.04% |
| 35371 | 1738 | 17.38% | 2594 | 25.94% | 1158 | 11.58% | 249 | 2.49% | 24 | 0.24% |
| 36782 | 481 | 4.81% | 2317 | 23.17% | 1886 | 18.86% | 768 | 7.68% | 169 | 1.69% |
| 38193 | 77 | 0.77% | 1377 | 13.77% | 1981 | 19.81% | 1326 | 13.26% | 495 | 4.95% |
| 39604 | 13 | 0.13% | 743 | 7.43% | 1770 | 17.70% | 1646 | 16.46% | 908 | 9.08% |
| 41015 | 1 | 0.01% | 307 | 3.07% | 1167 | 11.67% | 1681 | 16.81% | 1264 | 12.64% |
| 42426 | 0 | 0.00% | 78 | 0.78% | 756 | 7.56% | 1398 | 13.98% | 1460 | 14.60% |
| 43836 | 0 | 0.00% | 32 | 0.32% | 407 | 4.07% | 1023 | 10.23% | 1386 | 13.86% |
| 45247 | 0 | 0.00% | 11 | 0.11% | 186 | 1.86% | 719 | 7.19% | 1213 | 12.13% |
| 46658 | 0 | 0.00% | 2 | 0.02% | 104 | 1.04% | 443 | 4.43% | 951 | 9.51% |
| 48069 | 0 | 0.00% | 1 | 0.01% | 39 | 0.39% | 303 | 3.03% | 703 | 7.03% |
| 49480 | 0 | 0.00% | 1 | 0.01% | 22 | 0.22% | 172 | 1.72% | 474 | 4.74% |
| 50891 | 0 | 0.00% | 0 | 0.00% | 9 | 0.09% | 103 | 1.03% | 321 | 3.21% |
| 52302 | 0 | 0.00% | 0 | 0.00% | 4 | 0.04% | 53 | 0.53% | 214 | 2.14% |
| 53712 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 28 | 0.28% | 166 | 1.66% |
| 55123 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 15 | 0.15% | 90 | 0.90% |
| 56534 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 8 | 0.08% | 60 | 0.60% |
| 57945 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 5 | 0.05% | 41 | 0.41% |
| 59356 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 3 | 0.03% | 29 | 0.29% |
| 60767 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 2 | 0.02% | 9 | 0.09% |
| 62178 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 5 | 0.05% |
| 63588 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 5 | 0.05% |
| 64999 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 2 | 0.02% |
| 66410 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 4 | 0.04% |
| 67821 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 3 | 0.03% |
| SUM | 10000 | 1 | 10000 | 1 | 10000 | 1 | 10000 | 1 | 10000 | 1 |

Table 4.9 shows the frequency of 10000 scenarios sales, the interval size is 1411, we can get some information, for example, the most frequency interval is between 32550 million yuan and 33960 million yuan in 2018, which means expected sales could be the average of 32549.52 million yuan and 33960 million yuan. Same as in 2019, sales will have 25.94 % possibility between 33960 million yuan and 35371 million yuan. Then organize the frequency on different interval and get the possibility of each interval, finally we can get the final sales probability distribution in next five years.

Figure 4.5 Probability distribution of predict sales

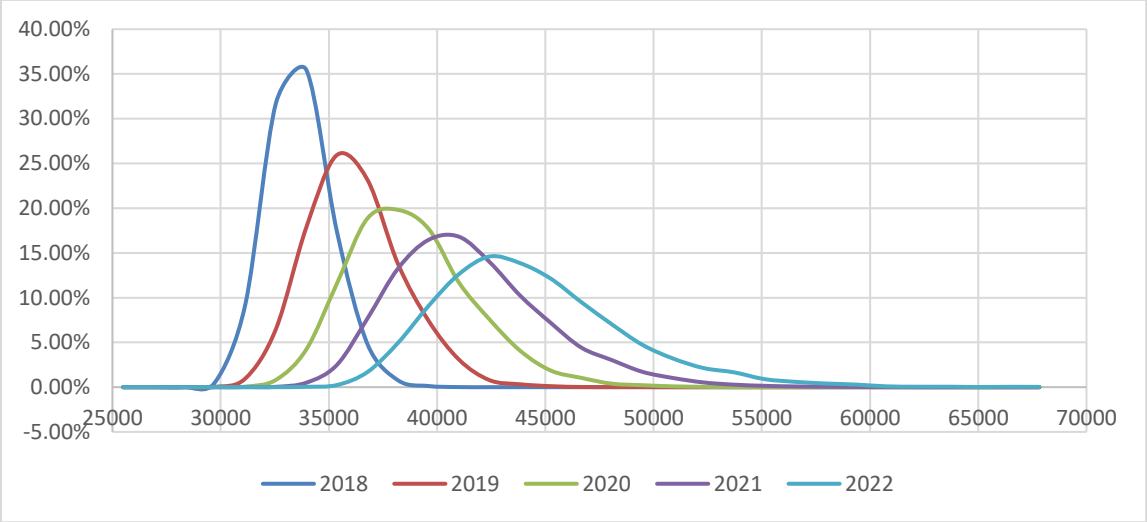



Figure 4.5 shows the possibility distribution of predicted sales, we can see the expected mean value of sale from 2018 to 2022 is increasing, which means sales has opportunity to increase in future, and standard deviation is also become bigger from 2018 to 2022, which means the error is become bigger, the longer year we estimate will have higher error. In other words, with higher future sale, there will exist higher risk. In order to make the distribution more clearly, we make a percentile table.

Table 4.10 Estimated characteristics of sales (Unit: million yuan)

| | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|
| Percentile 10% | 31154 | 32814 | 34681 | 36686 | 38758 |
| Percentile 5% | 30761 | 32234 | 33945 | 35812 | 37779 |
| Percentile1% | 29999 | 31138 | 32681 | 34387 | 36297 |
| Percentile 0.01% | 28824 | 29209 | 29793 | 31946 | 33510 |

From Table 4.10, we can state that in 2018, percentile with 10% means that the sales of CR beer has 90% possibility to be greater than 31154 million yuan, percentile with 5% means that the sales of CR beer has 95% possibility to be greater than 30761 million yuan, percentile with 1% means that the sales of CR beer has 99% possibility to be greater than

29999 million yuan, percentile with 0.01% means that the sales of CR beer has 99.9% possibility to be greater than 28824 million yuan. Same as in 2019 to 2022.

### 4.2 Financial plan

In this part we will do financial plan of China resources beer. Because we need to predict free cash flow of firm (FCFF), Therefore we will do plan of Earning before interest and tax (EBIT), plan of net working capital, plan of investment and plan of depreciation.

**Plan of EBIT**

First, we choose forecast driver as operating margin, because sales have a strong relationship with EBIT, we will collect historical sales and EBIT to get historical operating margin.

Table 4.11 Operating margin from 2008 to 2017 (unit: million yuan)

| year | EBIT | Sales | Operating Margin |
|---|---|---|---|
| 2008 | 3226 | 50459 | 6.39% |
| 2009 | 3897 | 56453 | 6.90% |
| 2010 | 4270 | 73811 | 5.78% |
| 2011 | 4335 | 89274 | 4.86% |
| 2012 | 5376 | 102381 | 5.25% |
| 2013 | 3786 | 115105 | 3.29% |
| 2014 | 1354 | 133174 | 1.02% |
| 2015 | 1783 | 27959 | 6.38% |
| 2016 | 1757 | 28694 | 6.12% |
| 2017 | 1851 | 29732 | 6.23% |

From Table 4.11, we can calculate historical operating margin from 2008 to 2017, we can see from table that operating margin is not very stable, it fell to the bottom in 2014 then begin to increase since 2015 and keep stable at 6% from 2015 to 2017, therefore we will give different weight to historical operating margin, because older data can make less influence on future prediction, we will set low weight from 2008-2013, in

order to make suitable weight, we will set lower weight for 2013 and 2014 because of the sharply decrease, set higher weight to recent three years, total weight should sum up to 1.

Table 4.12 Operating margin with weight

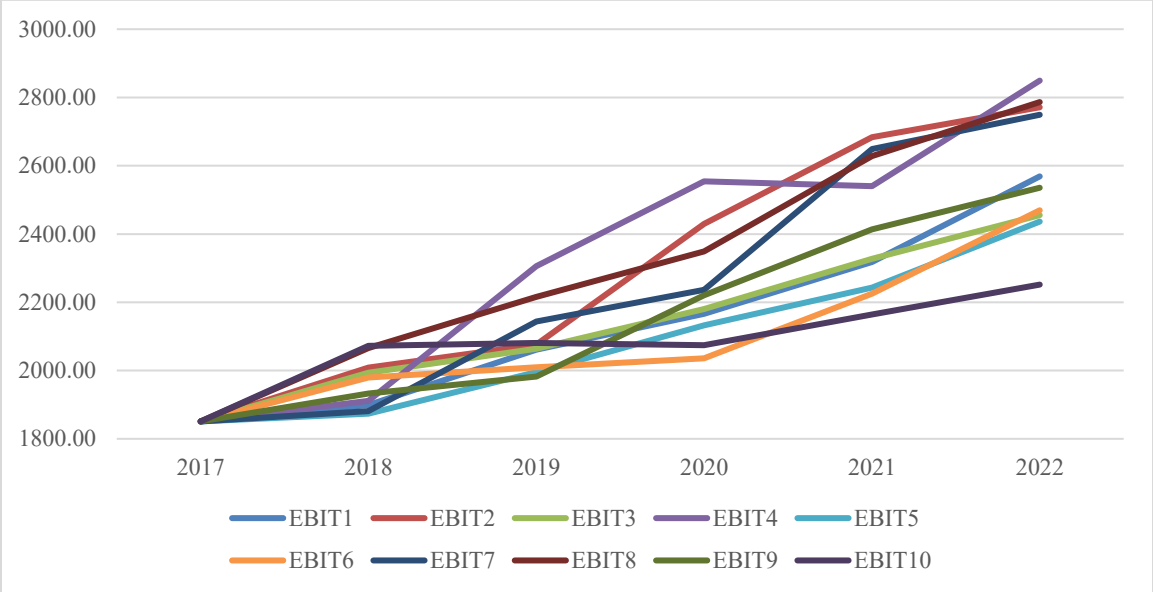
| Year | Operating Margin | Weight |
|---|---|---|
| 2008 | 6.39% | 0.01 |
| 2009 | 6.90% | 0.02 |
| 2010 | 5.78% | 0.03 |
| 2011 | 4.86% | 0.04 |
| 2012 | 5.25% | 0.05 |
| 2013 | 3.29% | 0.04 |
| 2014 | 1.02% | 0.01 |
| 2015 | 6.38% | 0.15 |
| 2016 | 6.12% | 0.2 |
| 2017 | 6.23% | 0.45 |
| SUM | | 1 |

According to the formula (2.35) in Chapter 2, we can calculate weighted average operating margin equal to 0.05957

$$\sum_{i=1}^{t} k_i \times w_i = 0.05957$$

Because we already predict 10000 scenarios sales in future five years, according to the formula of operating margin, we assume future operating margin is stable at 0.05957, we can get future EBIT from formula (2.34), there are 10000 scenarios of EBIT, we will present 10 of them, they are graphed below:

Figure 4.6 10 samples of EBIT prediction (Unit: million yuan)




From Figure 4.6, we can see that 10 samples of EBIT have a trend of increasing in future, it means that earning of CR beer has great chance to increase in future five years.

**Plan of Net Working Capital**

Net working capital is the difference between current assets and currents liabilities, therefore when we calculate the change of net working capital, we should first estimate current assets and current liabilities, we can use current assets/sales and current liabilities/sales as forecast driver.

Table 4.13 Results of CA/SALES and CL/SALES from 2008 to 2017 (Unit: million yuan)

| Year | Current Assets | Current liabilities | CA/SALES | CL/SALES | Weight |
|---|---|---|---|---|---|
| 2008 | 21778 | 22240 | 43% | 44% | 0.01 |
| 2009 | 23265 | 25808 | 41% | 46% | 0.02 |
| 2010 | 31336 | 31913 | 42% | 43% | 0.02 |
| 2011 | 41178 | 43109 | 46% | 48% | 0.03 |
| 2012 | 41774 | 47189 | 41% | 46% | 0.03 |
| 2013 | 49714 | 57932 | 43% | 50% | 0.04 |
| 2014 | 51448 | 68103 | 39% | 51% | 0.05 |
| 2015 | 11036 | 18750 | 39% | 67% | 0.2 |
| 2016 | 11028 | 20805 | 38% | 73% | 0.26 |
| 2017 | 9386 | 19195 | 32% | 65% | 0.34 |
| SUM | | | | | 1 |

we will give relatively high weight to data from 2015-2017, the weight will consider with the length of time, older data will be given lower weight, then we can get the weighted average CA/Sales and CA/Sales:

$$\frac{CA}{Sales} = 37.0\%$$

$$\frac{CL}{Sales} = 63.8\%$$

Since we already predict 10000 scenarios sales, therefore according to the formula of net working capital, we can get 10000 scenarios net working capital. The following figures prediction of current assets and current liabilities.

Figure 4.7 Prediction of Current assets (Unit: million yuan)

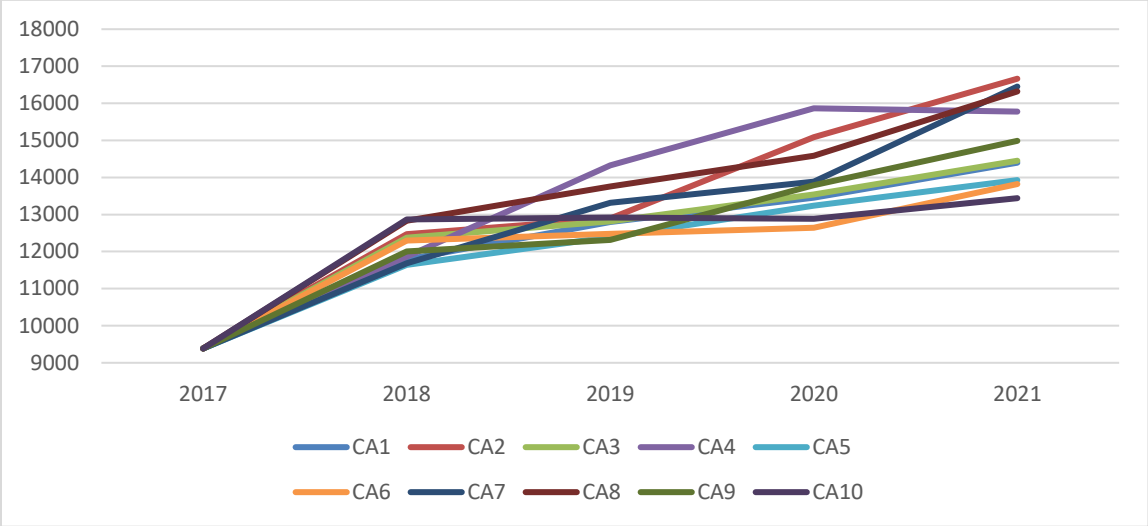



Figure 4.8 Prediction of Current liabilities (Unit: million yuan)

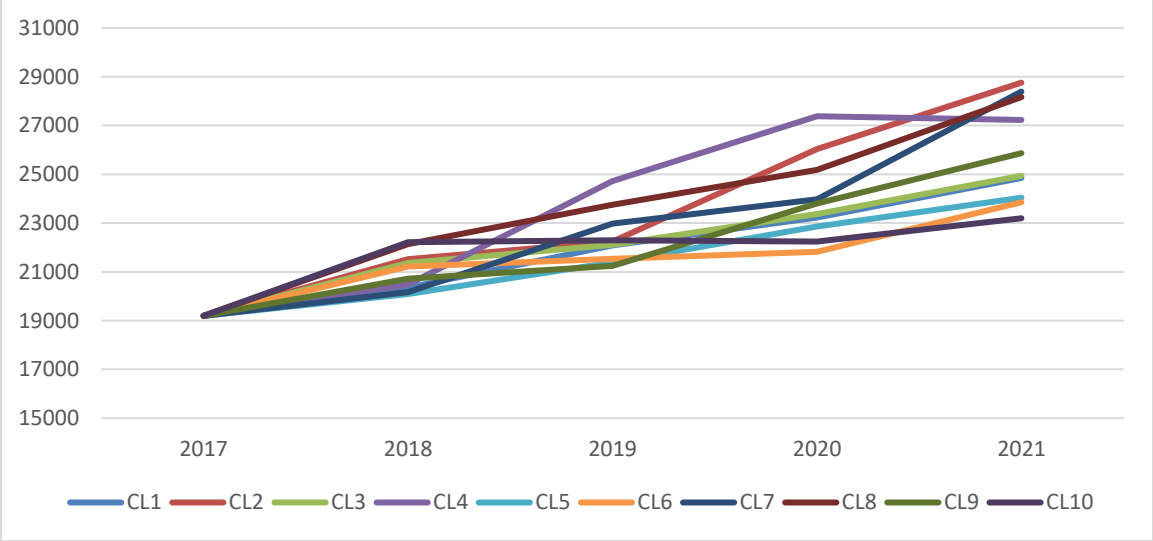
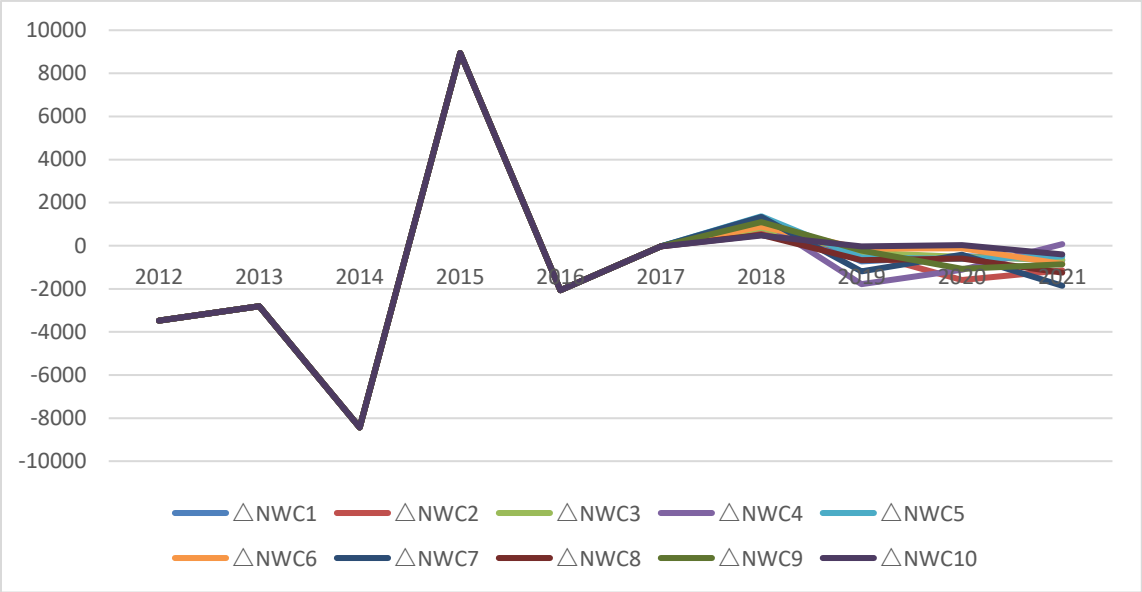



Figure 4.7 and Figure 4.8 Present 10 samples of 10000 scenarios, we can see both current assets and current liabilities has trend of increasing in next four years, after we predict current assets and current liabilities, we can get net working capital in next four years, then use the base year minus previous years, we can get the change of net working capital.

Figure 4.8 Prediction of △NWC (Unit: million yuan)




Because our prediction is based on the historical data, as we can see form Figure 4.8, the historical net working capital used to be negative except in 2015, this can reveal the liquidity ratio of company is not so good. Then in 2015, company made transformation to a beer selling company, the current assets and current liabilities decreased sharply, but current assets reduced more than current assets, that's why net working capital increased suddenly. As for the predicted $\Delta NWC$, we can see that $\Delta NWC$ increase in 2018, then most of scenarios has decreased to be negative since 2018, it means net working capital has decreasing trend in next four years, This prediction result can also tell that company's liquidity is behave not so good, the current assets can not afford to pay the current liabilities.

**Plan of investment**

Investment we use to analysis is the additions to non-current assets, including physical assets such as property, buildings, an industrial plant, technology or equipment. We can find the purchase and sells of fixed assets in annual Cash flow statement. To predict the investment in next four years, we need to use forecast driver Investment/sales, because we already predict sales, we can calculate the ratio of investment to sales

according to historical data, then use weighted average method get weighted average weight.

Table 4.14 Investment and sales from 2008 to 2017(Unit: million yuan)

| Year | Investment | Sales | INV/SALES | weight |
|---|---|---|---|---|
| 2008 | 6249 | 50459 | 12% | 0.02 |
| 2009 | 4194 | 56453 | 7% | 0.02 |
| 2010 | 3436 | 73811 | 5% | 0.02 |
| 2011 | 5704 | 89274 | 6% | 0.03 |
| 2012 | 5623 | 102381 | 5% | 0.06 |
| 2013 | 5063 | 115105 | 4% | 0.07 |
| 2014 | 6311 | 133174 | 5% | 0.08 |
| 2015 | 4961 | 27959 | 18% | 0.15 |
| 2016 | 1863 | 28694 | 6% | 0.25 |
| 2017 | 1915 | 29732 | 6% | 0.3 |
| SUM | | | | 1 |

In Table 4.14, we give different weight to different years, we will give higher weight to last three years, then we use weighted average method get weighted average ratio is 7.91%, we will use stable average ratio 7.91% to forecast future investment, because we have 10000 sales scenarios, therefore we will have 10000 investment scenarios, we will present 10 of them, they are in the following figure.

Figure 4.10 Prediction of Investment (Unit: million yuan)

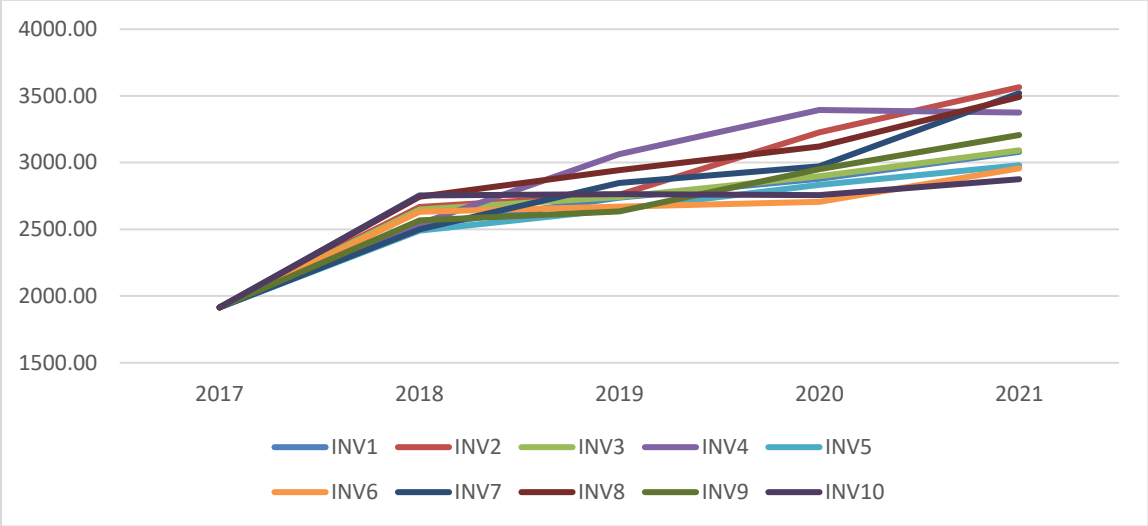



Figure 4.10 shows 10 scenarios of 10000 investment scenarios, we can see the trend of investment is increasing, it will increase sharply in 2018, then increase steady.

**Plan of depreciation**

The first step is to get fixed assets in next four years, because we already predict investment, we can get predict fixed assets according to the previous fixed assets plus next year's investment. Because we have 10000 scenarios of investment, therefore we also have 10000 scenarios of fixed assets, we present 10 of them in the following figure.

Figure 4.11 10 samples of predicted fixed assets (Unit: million yuan)

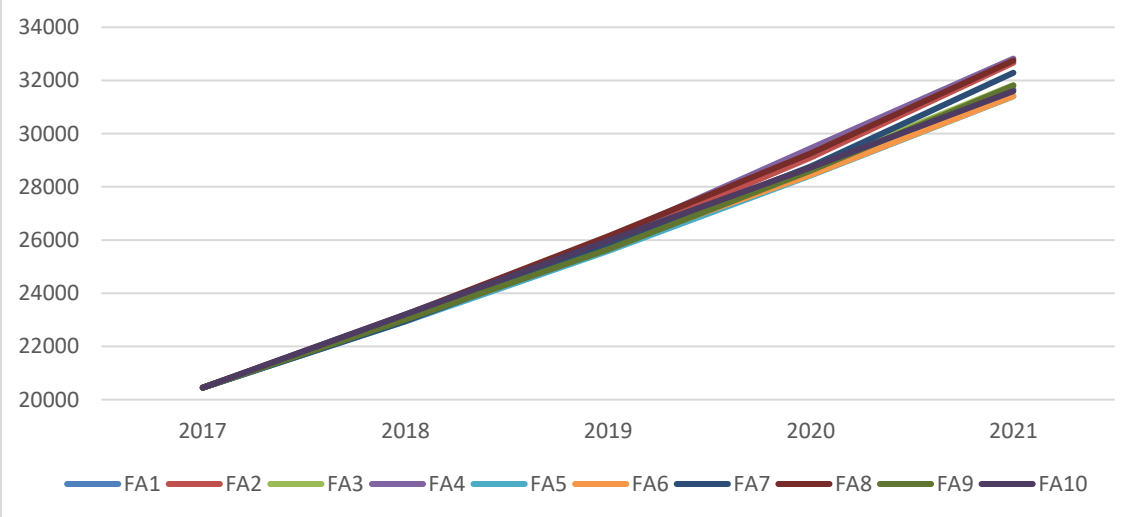


Figure 4.11 shows 10 samples of fixed assets; it has a trend of increasing. Next step is to find the ratio between depreciation and fixed assets, set weight on different years, calculate weighted average ratio.

Table 4.15 Depreciation and fixed assets from 2008 to 2017(Unit: million yuan)

| Year | Depreciation | Fixed assets | Depreciation/FA | weight |
|---|---|---|---|---|
| 2008 | 941 | 32057 | 2.9% | 0.01 |
| 2009 | 726 | 33590 | 2.2% | 0.02 |
| 2010 | 1031 | 35271 | 2.9% | 0.03 |
| 2011 | 1075 | 40747 | 2.6% | 0.04 |
| 2012 | 1186 | 46205 | 2.6% | 0.05 |
| 2013 | 1442 | 54337 | 2.7% | 0.06 |
| 2014 | 1698 | 69448 | 2.4% | 0.07 |
| 2015 | 1729 | 21383 | 8.1% | 0.15 |
| 2016 | 1721 | 20900 | 8.2% | 0.25 |
| 2017 | 1706 | 20449 | 8.3% | 0.32 |
| SUM | | | | 1 |

Table 4.15 shows the proportion of depreciation in fixed assets, the ratio is around 2% -3% during 2008-2014, then because of the transformation of company, the ratio increased sharply to 8.09%, then keep stable as time goes by. In order to make accurate estimation, we will give much higher weight to 2015-2017, total weight sum up to 1, then we use weighted average method getting the average ratio is 6.67%, the third step is use average ratio multiply predicted fixed assets, then we can get depreciation.

Figure 4.12 Prediction of depreciation (Unit: million yuan)

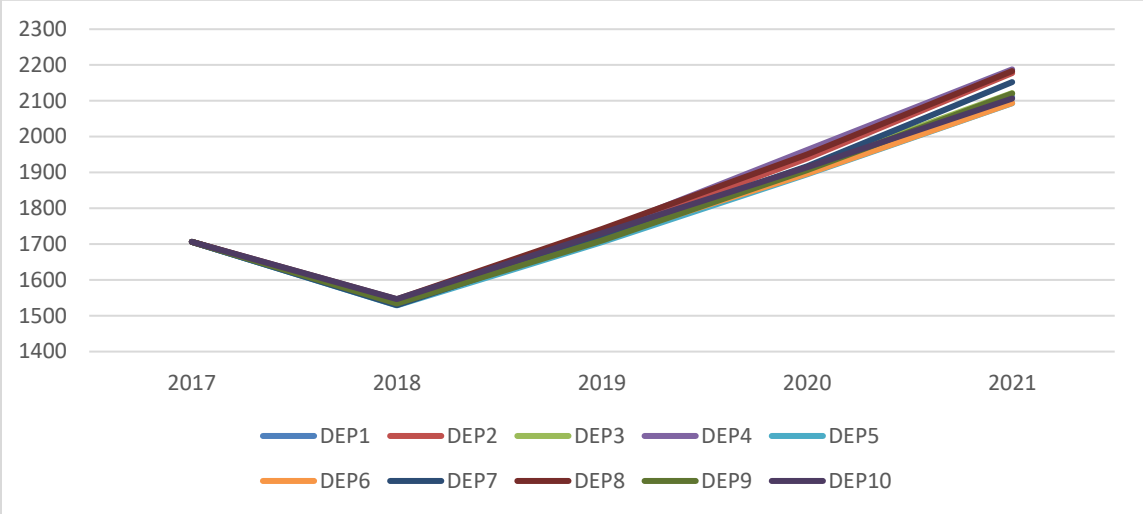



Figure 4.12 present the 10 scenarios of future depreciation from 2018 to 2021, it shows a growing tendency of depreciation except 2018. The reason for the decreasing in 2018 is the weighted average rate we used is 6.67%, compared with depreciation rate in 2017, it decreased by about 1.63%. We can calculate the average investment and depreciation of 10000 scenarios, they are show in the following table.

Table 4.16 Average investment and depreciation from 2018 to 2021 (Unit: million yuan)

| | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|
| DEP | 1537 | 1724 | 1925 | 2141 |
| INV | 2608 | 2808 | 3015 | 3233 |

If investment is lower than depreciation, it means as time goes by, the fixed assets will become more and more less, finally there will be no enough fixed assets to finance operating activities, this company will go bankruptcy, therefore investment is necessary to be higher than depreciation. We can see from Table 4.16 that investment is higher than depreciation.

**Plan of invested capital**

Because invested capital can be the difference between total capital and current liabilities approximately. As we already predict fixed assets, current assets and current

liabilities, we only need to predict other non-current assets which includes goodwill and intangible assets, because it is hard to predict it, we can make it a constant value since 2017 for the conservative purposes. The items we need for calculating invested capital are as follow:

Table 4.17 Items for calculating invested capital (Unit: million yuan)

| | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| **Current assets** | 9386 | 12189 | 13126 | 14092 | 15108 |
| **Non-current assets**: | | | | | |
| PP&E | 20449 | 23057 | 25865 | 28880 | 32113 |
| Other non-current assets | 10816 | 10816 | 10816 | 10816 | 10816 |
| **Current liabilities** | 19195 | 21034 | 22651 | 24317 | 26072 |
| **Invested capital** | 21456 | 25028 | 27157 | 29471 | 31966 |

In Table 4.17, PP&E means property, plants and equipment, this is the fixed assets of company. Because we have 10000 scenarios of current assets, current liabilities and fixed assets for each predicted year. We only present the average value of each predicted items in Table 4.17. Finally, we can calculate invested capital, it is shown on the last column.

**Estimation of tax rate**

Tax rate is also a key factor to estimate future FCFF, we use *Tax/EBIT* as forecast driver, we give weight to different years, and calculate weighted average ratio.

Table 4.18 Income tax expense and EBIT from 2008 to 2017(Unit: million yuan)

| Year | Income tax expense | EBIT | Tax rate | weight |
|---|---|---|---|---|
| 2008 | -673 | 3226 | 21% | 0.02 |
| 2009 | -806 | 3897 | 21% | 0.02 |
| 2010 | -1187 | 4270 | 28% | 0.02 |
| 2011 | -1261 | 4335 | 29% | 0.02 |
| 2012 | -1323 | 5376 | 25% | 0.02 |
| 2013 | -1489 | 3786 | 39% | 0.03 |
| 2014 | -1222 | 1354 | 90% | 0.1 |
| 2015 | -394 | 1783 | 22% | 0.15 |
| 2016 | -320 | 1757 | 18% | 0.22 |
| 2017 | -630 | 1851 | 34% | 0.4 |
| SUM | | | | 1 |

We give different weight to different years, recent year will be given higher weight, then we use weighted average method get weighted average ratio is 33.61%, we will use stable average ratio 33.61% as tax rate for next five years.

**Expected Random FCFF Evaluation for the first stage**

We can estimate FCFF for first stage according to formula (2.30), because we have already predicted EBIT, change of net working capital, investment, depreciation and tax rate for the first stage, we put all items we need for next calculation, the summary results are as follow:

Table 4.19 Data for estimation of FCFF (Unit: million yuan)

| | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|
| EBIT | 1963 | 2114 | 2269 | 2433 |
| △NWC | 964 | -680 | -701 | -738 |
| INV | 2608 | 2808 | 3015 | 3233 |
| DEP | 1537 | 1724 | 1925 | 2141 |
| TAX RATE | 33.60% | | | |
| FCFF | -732 | 999 | 1117 | 1261 |

Table 4.19 shows all the items we need for calculate future FCFF, because we have 10000 scenarios of EBIT, △NWC, INV, DEP, Table 4.18 is the average value of 10000 scenarios of EBIT, △NWC, INV, DEP, therefore we have 10000 scenarios of FCFF, we will present 10 of 10000 scenarios in following figure.

Figure 4.13 10 samples scenarios of FCFF prediction (Unit: million yuan)

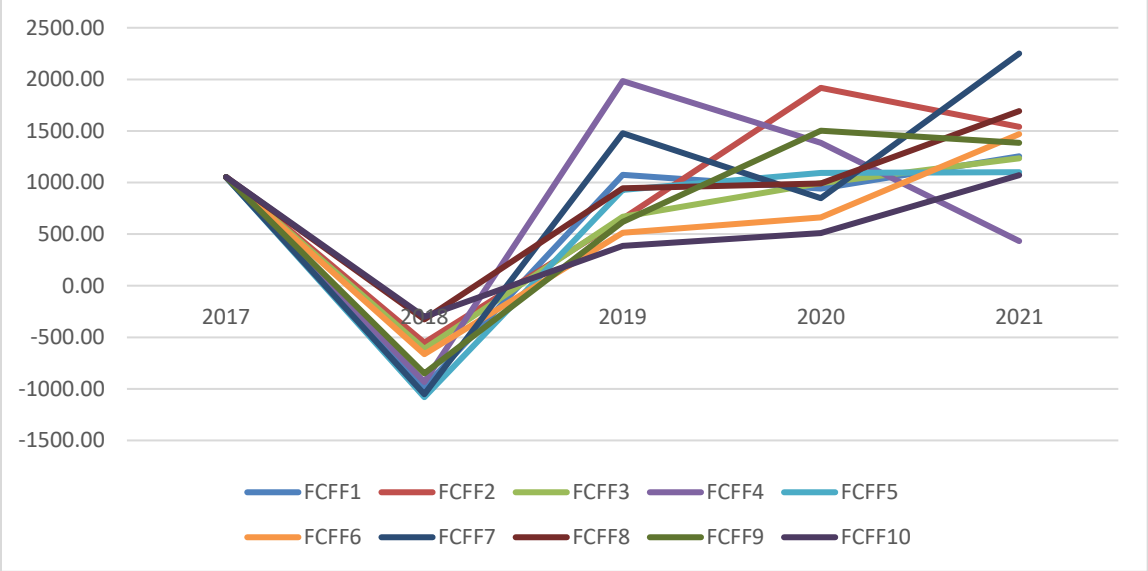



Figure 4.13 shows 10 scenarios of FCCFF for next four years, we can see except 2018, most of scenarios has trend of increasing, the reason why FCFF in 2018 is decreasing is that the △NWC in 2018 is positive and much higher than previous year, the core reason is the weighted current assets to sales ratio we used for prediction current assets is 37%, but the current assets to sales ratio in 2017 is 31%, therefore the predicted

current assets in 2018 will be very high, it will cause a big gap between current asset in 2017 and in 2018.

### 4.3 Cost of Capital Calculation

In this part, we will calculate weighted average cost of capital according to formula (2.41), because we already know tax rate, therefore we need to calculate D/K, E/K ratio, cost of equity and cost of debt.

#### 4.3.1 Weight of debt and equity

We can find total debt and total equity of CR beer in balance sheet, then we can easily calculate the D/K and E/K ratio, the results are shown as follow:

$$\frac{D}{K} = 27.5\%$$

$$\frac{E}{K} = 72.5\%$$

#### 4.3.2 Cost of equity

We will use CAPM model to calculate cost of equity, according to the formula (2.43), we need to find the risk-free rate, β coefficient and risk premium.

For the risk-free rate, because we use two-stage DCF method, therefore we need two risk-free rates for each period, for the first period which is from 2018 to 2021, we use the return of China 3-year government bond, for the second period which is from 2022 to infinity, we will use China 30-year government bond. We can find information on the official website of finance ministry of China.[6]

$$R_f(3) = 2.94\%$$

$$R_f(30) = 3.82\%$$

[6] http://yield.chinabond.com.cn/cbweb-czb-web/czb/moreInfo?locale=en_US

For the β coefficient, we can find specific β coefficient for CR beer company in wind fee-based database, it is equal to 0.7[7].

For the risk premium, we can also find it on Website Damodaran, the equity risk premium of China is 6.94%.

After collecting and calculate all the items, we can get two different cost of equity for different stage, the results are

$$\mathrm{E}(R_{e1}) = 7.77\%$$

$$\mathrm{E}(R_{e2}) = 8.65\%$$

### 4.3.3 Cost of Debt

To estimate cost of debt, we need to know the coupon payment of long-term bond that company issued, since CR beer has not issued bonds, we will use the cost of debt of alcohol beverage in China, we can find the specific cost of debt on website Damodaran, which is equal to 4. 78%[8]. Then we check the loan rate of bank in China is around 4.35%[9], to be more conservative, we will use the average of two ratios, which is equal to 4.57% as the cost of debt for CR beer.

After we calculate cost of equity and cost of debt, we can easily get weighted average cost of capital.

$$WACC_1 = 6.47\%$$

$$WACC_2 = 7.53\%$$

[7] https://www.wind.com.cn/en/

[8] http://pages.stern.nyu.edu/~adamodar/

[9] https://www.ceicdata.com/en/indicator/china/bank-lending-rate

### 4.4 Return on invested capital

After we calculate the weighted average cost of capital for two stages, we need to calculate the return on invested capital according the key value driver formula (2.32). because we already predict invested capital, EBIT and tax rate for the first stage. We can calculate ROIC. We integrate historical ROIC and predicted ROIC in the following table.

Table 4.20 Prediction of ROIC

| | EBIT(1-t) | Invested capital | ROIC | Weight |
|---|---|---|---|---|
| 2008 | 2553 | 39362 | 6.49% | 0.01 |
| 2009 | 3091 | 40624 | 7.61% | 0.02 |
| 2010 | 3083 | 44174 | 6.98% | 0.03 |
| 2011 | 3074 | 48989 | 6.27% | 0.04 |
| 2012 | 4053 | 56208 | 7.21% | 0.05 |
| 2013 | 2297 | 64150 | 3.58% | 0.06 |
| 2014 | 132 | 74929 | 0.18% | 0 |
| 2015 | 1389 | 24019 | 5.78% | 0.08 |
| 2016 | 1437 | 21825 | 6.58% | 0.09 |
| 2017 | 1221 | 21456 | 5.69% | 0.1 |
| 2018 | 1303 | 25028 | 5.21% | 0.11 |
| 2019 | 1403 | 27157 | 5.17% | 0.13 |
| 2020 | 1507 | 29471 | 5.11% | 0.14 |
| 2021 | 1615 | 31966 | 5.05% | 0.14 |
| SUM | | | | 1 |

We can see from Table 4.20, The range of fluctuations in historical ROIC generally ranges from 5% to 8% except in 2014, therefore we will exclude ROIC for 2014, then calculate weighted average ROIC. It is show as follows:

$$ROIC = 5.54\%$$

Compared with the WACC we already estimated, the ROIC is lower than the WACC for second stage. It means the required rate of return of company is lower than

the expected rate of return of company, in other words, the value is destroyed as the company invests more capital, for every RMB of investment the company attracts it pays out more than it earns with it, therefore if company still has increasing growth rate, company will create much more loss, which means the economic value is negative, the expected market value will decrease.

### 4.5 Growth rate

The last unknown parameter for calculating company's market value is growth rate of company. We can calculate growth rate of FCFF by the following formula:

$$g = IR \cdot ROIC \tag{4.2}$$

$$IR = \frac{\Delta NWC + INV - DEP}{EBIT(1-t)} \tag{4.3}$$

Where in formula (4.2), $IR$ means investment rate, it is the ratio of total investment to net operating profit after tax (NOPAT). $\Delta NWC$ is changes of net working capital, $INV$ is investment, $DEP$ is depreciation. Since we already predict ROIC, and we can also calculate historical and first stage's IR. They are shown as follows:

Table 4.21 Prediction of IR

| | EBIT(1-t) | Total investment | IR | weight |
|---|---|---|---|---|
| 2008 | 2553 | | | |
| 2009 | 3091 | 1386 | 45% | 0.05 |
| 2010 | 3083 | 4370 | 142% | 0 |
| 2011 | 3074 | 3275 | 107% | 0 |
| 2012 | 4053 | 953 | 24% | 0.08 |
| 2013 | 2297 | 818 | 36% | 0.09 |
| 2014 | 132 | -3823 | -2903% | 0 |
| 2015 | 1389 | 12173 | 877% | 0 |
| 2016 | 1437 | -1921 | -134% | 0 |
| 2017 | 1221 | 177 | 14% | 0.13 |
| 2018 | 1303 | 2035 | 156% | 0 |
| 2019 | 1403 | 405 | 29% | 0.15 |
| 2020 | 1507 | 389 | 26% | 0.2 |
| 2021 | 1615 | 354 | 22% | 0.3 |
| SUM | | | | 1 |

Table 4.21 present the items we need for calculating IR, we can see IR is very unstable, volatile especially during 2014 to 2016. We will exclude ratio which are greater than 100% and negative, only give weight to rest of them, finally, we calculate the IR ratio, it is show as follows:

$$IR = 25.28\%$$

The last step is use formula (4.2), calculate the growth rate for second stage, the result is shown as follows:

$$g = 1.40\%$$

## 4.5 Estimate Value of China Resource Beer Company Limited

The first stage is from 2018 to 2021, we already know FCFF and WACC in first stage, after applying the formula (2.30), we can get 10000 scenarios of valuation for the first stage.

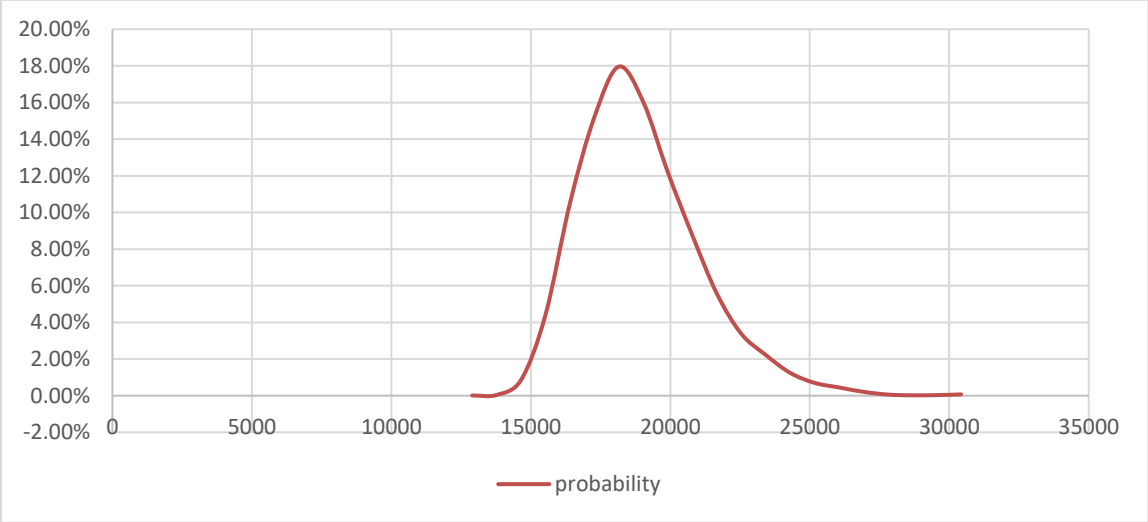
The second stage is from 2022 to infinity, we assume company has constant growth rate in second stage, put all the parameters into formula (2.32), we can get 10000 scenarios of terminal value of FCFF. The last step is plus the valuation of two stage, we can get 10000 scenarios of valuation for CR beer.

In order to make our result more clearly, we will make a frequency distribution table, at first, we will identify the maximum and minimum value of CR beer, set the number of interval as 20 steps, then we get the interval which is equal to 876, next we will use excel function: frequency(), input all the data we need to analysis, we can get the frequency of 10000 scenarios of valuation, finally we get the probability distribution for 10000 scenarios of valuation for CR beer.

Table 4.22 Valuation frequency (Unit: million yuan)

| Interval | Frequency | probability |
|---|---|---|
| 12897 | 1 | 0.01% |
| 13773 | 4 | 0.04% |
| 14650 | 86 | 0.86% |
| 15526 | 442 | 4.42% |
| 16403 | 1051 | 10.51% |
| 17279 | 1521 | 15.21% |
| 18156 | 1796 | 17.96% |
| 19032 | 1602 | 16.02% |
| 19908 | 1220 | 12.20% |
| 20785 | 877 | 8.77% |
| 21661 | 559 | 5.59% |
| 22538 | 339 | 3.39% |
| 23414 | 223 | 2.23% |
| 24291 | 125 | 1.25% |
| 25167 | 70 | 0.70% |
| 26044 | 45 | 0.45% |
| 26920 | 21 | 0.21% |
| 27796 | 6 | 0.06% |
| 28673 | 2 | 0.02% |
| 29549 | 3 | 0.03% |
| 30426 | 7 | 0.07% |
| SUM | 10000 | 100.00% |

Figure 4.14 Probability distribution of value




From Table 4.22, we can state that the predicted value of CR beer is range from 12897 million yuan to 30426 million yuan, moreover, most of scenarios are between 17279 million yuan and 18156 million yuan, we can calculate the expected value is 18492 million yuan.

We can find the book value of CR beer on Balance sheet in 2017 is 40651 million yuan, which is twice as much as the expected market value 18492 million yuan. Therefore, CR beer is overvalued.

Table 4.23 Estimated characteristics of the value distribution of CR beer (Unit: million yuan)

| | |
|---|---|
| E(V) | 18492 |
| std(V) | 2171 |
| percentile 10% | 15978 |
| percentile 5% | 15497 |
| percentile1% | 14685 |
| percentile 0.01% | 13291 |

Table 4.23shows the expected mean value of CR beer is 18492 million yuan, percentile 10% means that the value of CR beer has 90% possibility to be greater than 15978 million yuan, percentile 5% means that the value of CR beer has 95% possibility

to be greater than 15497 million yuan, we can explain percentile 1% and 0.01% in same way. Therefore, we can state that CR beer has almost 100% possibility to be higher than 13291 million yuan.

### 4.5 Sensitivity analysis

In this part, we will do sensitivity analysis to find out what the value of CR beer will change if one parameter changes. When doing analysis, we will keep all other uncertain factors under the condition of basic value, only testing how the value of CR beer changes with the change of g and ROIC.

#### 4.5.1 Sensitivity analysis of growth rate

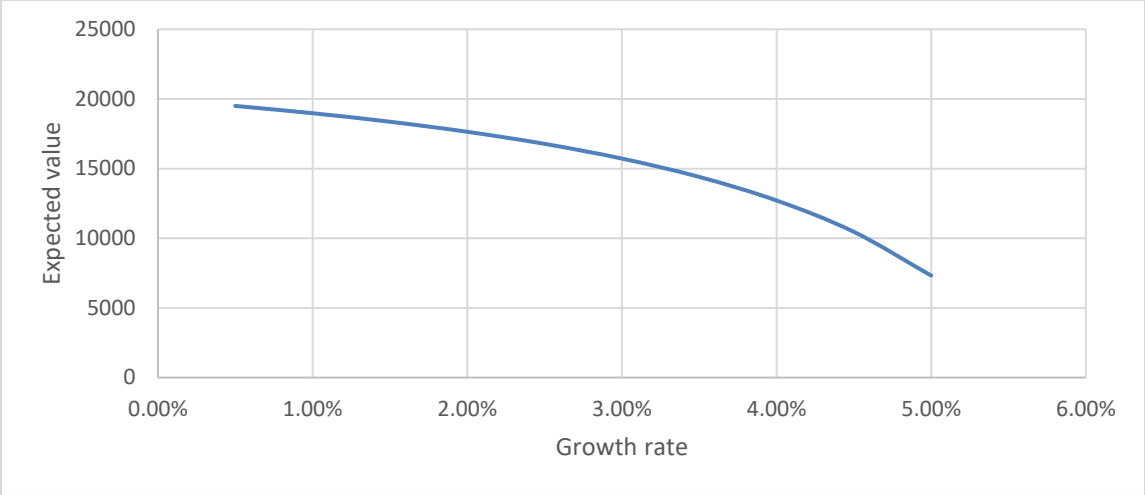
In this part, we will keep ROIC, WACC at constant level, we should know that with changing of g, investment rate will also change. Since we already know the growth rate for the second stage is 1.40%, according to formula (2.33), we need to find the relationship between g and expected value. The important standard is no matter how much g changes, we should always keep g less than WACC and ROIC. We estimated 10000 scenarios of value for CR beer, therefore according to two-stage DCF method, by using different growth rate, we will get different 10000 scenarios of valuation, then we can calculate the expected value of 10000 scenarios of valuation, they are shown in following table.

Table 4.24 Expected value with different growth rate (Unit: million yuan)

| Growth rate | 0.50% | 1.00% | 1.50% | 2.00% | 2.50% | 3.00% |
|---|---|---|---|---|---|---|
| Expected value | 19500 | 18976 | 18365 | 17643 | 16778 | 15722 |
| Growth rate | 3.50% | 4.00% | 4.50% | 5.00% | | |
| Expected value | 14404 | 12712 | 10462 | 7321 | | |

From Table 4.24, we can see that as growth rate increase from 1% to 5%, and ROIC ,WACC don’t change, the expected value of CR beer is decreasing from 19500 million yuan to 7321 million yuan, there exist a negative relationship between expected value and growth rate, we can see the slop and speed in following figure.

Figure 4.15 Expected value with different growth rate (Unit: million yuan)




From Figure 4.15, we can see that the higher growth rate will cause higher decreasing speed of expected value, which means for every additional % of g, the value will be reduced by more. To be more practical, when company's ROIC is smaller than WACC, the economic value added is negative, if g increasing, loss will become greater, therefore the expected market value will decrease.

The next step is under the situation of growth rate 1.40%, we will test the change of valuation when growth rate increase and decrease by 60%.

Decreased by 60%:

$$g_1 = g \times (1 - 60\%) = 0.56\%$$

Increased by 60%:

$$g_2 = g \times (1 + 60\%) = 2.24\%$$

With different growth rate, we can get different probability distribution of valuation, they are shown in following figure.

Figure 4.16 Probability distribution of valuation with different growth rate (Unit: million yuan)

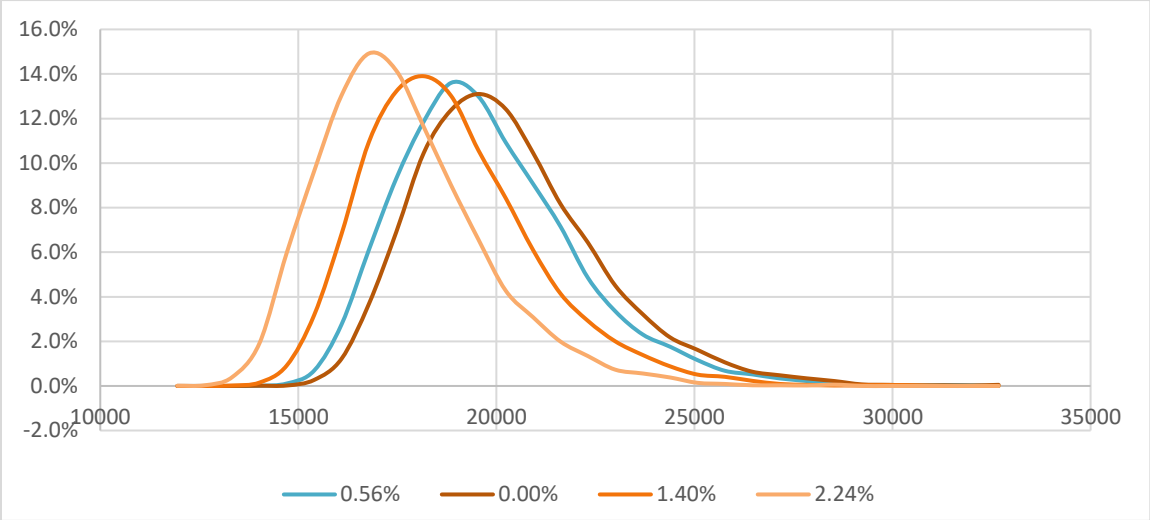



Figure 4.16 shows the possibility distribution of valuation of CR beer, in first situation, when growth rate decreases by 60%, which is the curve named "0.56%". The probability of valuation distribution will move to right at a relatively small distance, the expected value of CR beer will increase by 947 million yuan. In second situation, when growth rate increases by 60%, which is the curve named "2.24%", the probability of valuation distribution will move to left at a relatively far distance compared with the first situation, the expected value of CR beer will decrease by 1249 million yuan. we can state that with the same level changing growth rate, the increasing of growth rate is much more significant than decreasing of growth rate.

On the other hand, we can calculate maximum expected value when g changes, because g has negative relationship with expected market value, therefore if we want to have maximum expected market value, we should set minimum g. The curve "0.00%" shows the minimum growth rate and maximum expected market value, it is equal to 19954 million yuan, still lower than the book value of company.

### 4.5.2 Sensitivity analysis of ROIC

In this part, we will keep growth rate at constant level, but we need to realize that when ROIC changes and growth rate keep constant, the investment rate will also change,

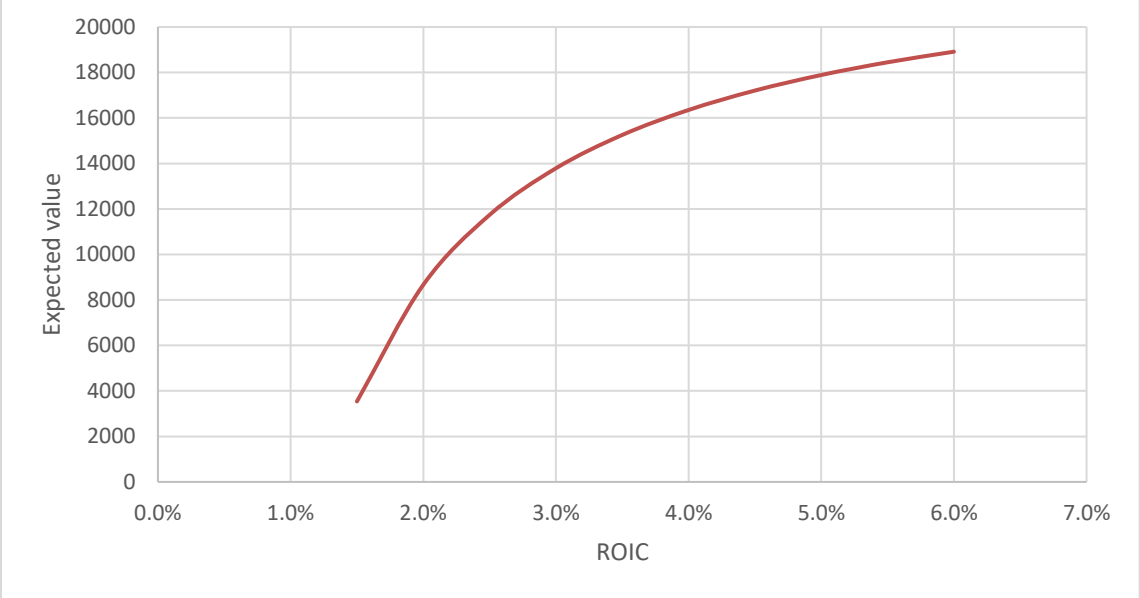
since we already know the ROIC for the second stage is 5.54%, according to formula (2.33), we can see there exist positive relationship between ROIC and expected market value. The important standard is no matter how much ROIC changes, we should always keep ROIC higher than growth rate. We estimated 10000 scenarios of valuation for CR beer, therefore according to two-stage DCF method, by using different ROIC, we will get different 10000 scenarios of valuation, then we can calculate the expected value of 10000 scenarios of valuation, they are shown in following table.

Table 4.25 Expected value with different ROIC (Unit: million yuan)

| ROIC | 1.50% | 2.00% | 2.50% | 3.00% | 3.50% | 4.00% |
|---|---|---|---|---|---|---|
| Expected value | 3538 | 8663 | 11738 | 13788 | 15253 | 16351 |
| ROIC | 4.50% | 5.00% | 5.50% | 6.00% | | |
| Expected value | 17205 | 17888 | 18448 | 18914 | | |

From Table 4.25, we can see that as ROIC increase from 1.5% to 6%, the expected value of CR beer is increasing from 3538 million yuan to 18914 million yuan, there exist a positive relationship between expected value and ROIC, we can see the slop and increasing speed in following figure.

Figure 4.17 Expected value with different ROIC (Unit: million yuan)



From Figure 4.17, we can see that the higher ROIC will cause lower increasing speed of expected value, which means for every additional % of ROIC, the value will be increased by less. To be more practical, when company's ROIC increase, the expected rate of return for company is increasing, the economic value added increased.

The next step is under the situation of ROIC 5.54%, we will test the change of valuation when ROIC increase and decrease by 60%.

Decreased by 60%:

$$ROIC_1 = ROIC \times (1 - 60\%) = 2.22\%$$

Increased by 60%:

$$ROIC_2 = ROIC \times (1 + 60\%) = 8.87\%$$

With different ROIC, we can get different probability distribution of valuation, they are shown in following figure.

Figure 4.18 Probability distribution of valuation with different ROIC (Unit: million yuan)

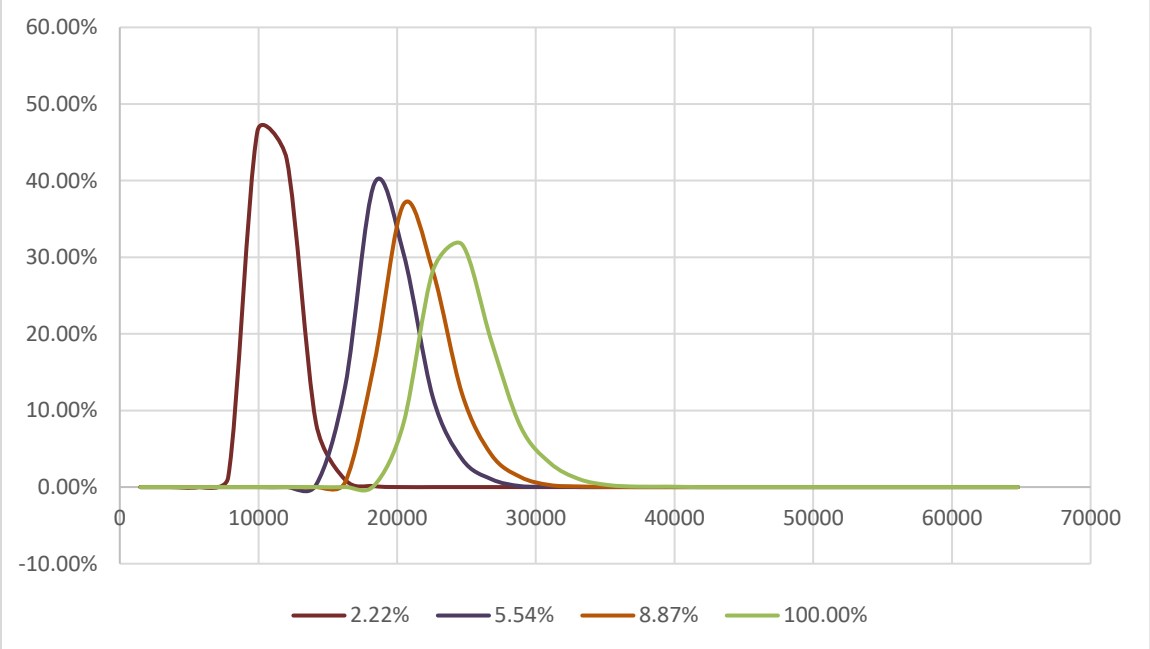



Figure 4.18 shows the possibility distribution of valuation of CR beer, in first situation, when ROIC decreases by 60%, which is the curve named "2.22%". The

probability of valuation distribution will move to left at a relatively far distance; the expected value of CR beer will decrease by 8320 million yuan. In second situation, when ROIC increases by 60%, which is the curve named “8.87%”, the probability of valuation distribution will move to right at a relatively small distance compared with the first situation, the expected value of CR beer will increase by 2080 million yuan. we can state that with the same level changing ROIC, the decreasing of ROIC is much more significant than increasing of ROIC.

Because ROIC has positive relationship with expected market value, therefore if we want to get maximum expected market value, we should set maximum ROIC. The curve “100.00%” shows the maximum ROIC and maximum expected market value, it is equal to 23731million yuan, still lower than the book value of company.

### 4.5.3 Combination of growth rate and ROIC

In this part, the main purpose is to find out whether the change of g and ROIC can contribute the expected value higher than the book value. We keep the WACC for the second stage still at constant level 7.53%. Because we already get result that when ROIC< WACC, there is no possibility for company to make expected market value higher than book value. Therefore, we can change the ROIC from 7.53% to larger, and the growth rate will be change from 1.4% to 7.53%.

Table 4.26 Expected value of CR beer when g and ROIC change together. (Unit: million yuan)

| ROIC / g | 7.53% | 8.53% | 9.53% | 10.53% | 11.53% | 12.53% | 13.53% | 14.53% | 15.53% | 16.53% |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.40% | 19954 | 20195 | 20622 | 20964 | 21243 | 21476 | 21673 | 21842 | 21989 | 22117 |
| 2.07% | 19954 | 20353 | 21060 | 21626 | 22089 | 22474 | 22801 | 23080 | 23323 | 23535 |
| 2.74% | 19954 | 20554 | 21620 | 22472 | 23169 | 23750 | 24242 | 24663 | 25028 | 25348 |
| 3.40% | 19954 | 20821 | 22360 | 23591 | 24598 | 25438 | 26148 | 26757 | 27284 | 27746 |
| 4.07% | 19954 | 21191 | 23386 | 25142 | 26579 | 27776 | 28789 | 29658 | 30410 | 31069 |
| 4.74% | 19954 | 21737 | 24902 | 27433 | 29504 | 31230 | 32691 | 33943 | 35028 | 35977 |
| 5.40% | 19954 | 22626 | 27368 | 31161 | 34264 | 36850 | 39039 | 40914 | 42540 | 43962 |
| 6.07% | 19954 | 24327 | 32085 | 38292 | 43370 | 47602 | 51183 | 54252 | 56912 | 59240 |
| 6.74% | 19954 | 28884 | 44729 | 57406 | 67777 | 76420 | 83733 | 90002 | 95435 | 100188 |
| 7.40% | 19954 | 81357 | 190311 | 277474 | 348790 | 408219 | 458506 | 501608 | 538964 | 571650 |

Table 4.36 shows the different combination of growth rate and ROIC. When ROIC is equal to WACC, change growth rate will not influence expected market value, if CR beer want to increase its expected market value, it must increase its ROIC and keep it higher than WACC, then when the ROIC is higher than 8.53%, it is possible for CR beer to create market value higher than the book

value. We can see when ROIC is 8.53% and growth rate is 7.4% the expected value of company is 81357 million yuan; it is higher than the book value 40651 million yuan in 2017.

To make our result more visible, we present the absolute change of expected value to book value. The table is shown as follows:

Table 4.37 Absolute change of expected value compared with book value. (Unit: million yuan)

| ROIC / g | 7.53% | 8.53% | 9.53% | 10.53% | 11.53% | 12.53% | 13.53% | 14.53% | 15.53% | 16.53% |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.40% | -20697 | -20456 | -20029 | -19687 | -19408 | -19175 | -18978 | -18809 | -18662 | -18534 |
| 2.07% | -20697 | -20298 | -19591 | -19025 | -18562 | -18177 | -17850 | -17571 | -17328 | -17116 |
| 2.74% | -20697 | -20097 | -19031 | -18179 | -17482 | -16901 | -16409 | -15988 | -15623 | -15303 |
| 3.40% | -20697 | -19830 | -18291 | -17060 | -16053 | -15213 | -14503 | -13894 | -13367 | -12905 |
| 4.07% | -20697 | -19460 | -17265 | -15509 | -14072 | -12875 | -11862 | -10993 | -10241 | -9582 |
| 4.74% | -20697 | -18914 | -15749 | -13218 | -11147 | -9421 | -7960 | -6708 | -5623 | -4674 |
| 5.40% | -20697 | -18025 | -13283 | -9490 | -6387 | -3801 | -1612 | 263 | 1889 | 3311 |
| 6.07% | -20697 | -16324 | -8566 | -2359 | 2719 | 6951 | 10532 | 13601 | 16261 | 18589 |
| 6.74% | -20697 | -11767 | 4078 | 16755 | 27126 | 35769 | 43082 | 49351 | 54784 | 59537 |
| 7.40% | -20697 | 40706 | 149660 | 236823 | 308139 | 367568 | 417855 | 460957 | 498313 | 530999 |

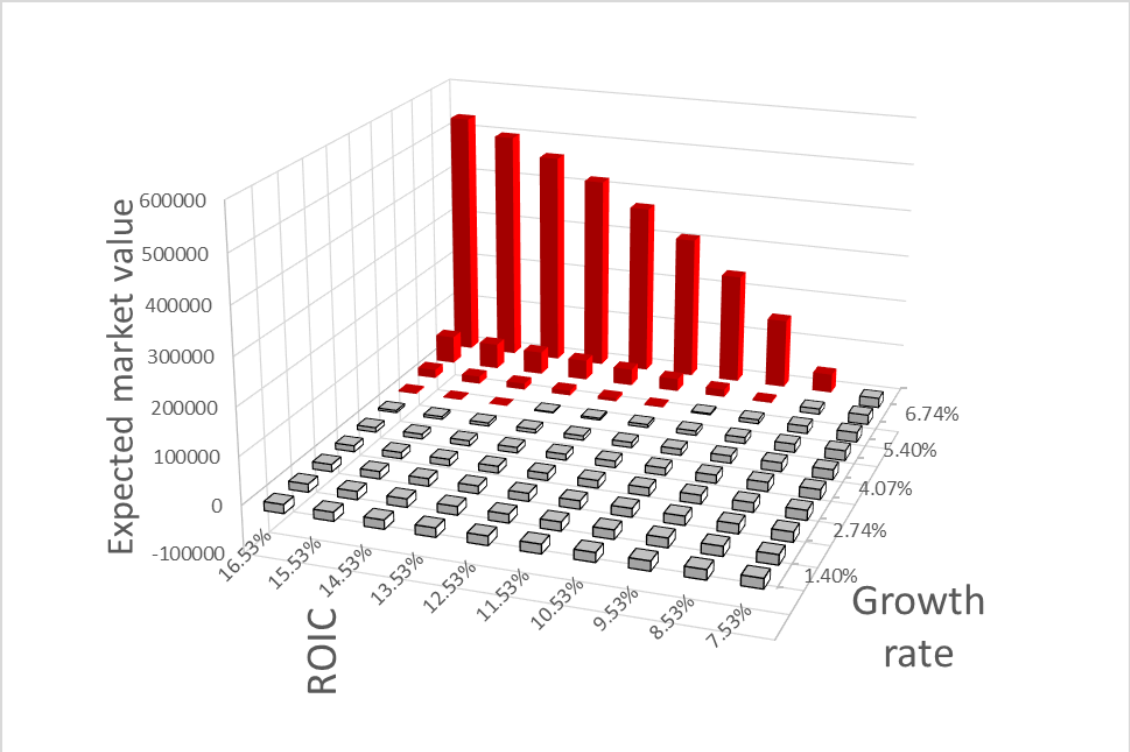
From Table 4.37, we can see the numbers with red color represent the combinations of growth rate and ROIC that can create higher market value compared with the book value. In this situation, the higher the ROIC, the higher possibility for company to create higher market value. We also present the change of investment rate for different combinations. They are shown as follows table.

Table 4.38 Investment rate when growth rate and ROIC changes.

| ROIC / g | 8% | 9% | 10% | 11% | 12% | 13% | 14% | 15% | 16% | 17% |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.40% | 19% | 16% | 15% | 13% | 12% | 11% | 10% | 10% | 9% | 8% |
| 2.07% | 27% | 24% | 22% | 20% | 18% | 17% | 15% | 14% | 13% | 13% |
| 2.74% | 36% | 32% | 29% | 26% | 24% | 22% | 20% | 19% | 18% | 17% |
| 3.40% | 45% | 40% | 36% | 32% | 30% | 27% | 25% | 23% | 22% | 21% |
| 4.07% | 54% | 48% | 43% | 39% | 35% | 32% | 30% | 28% | 26% | 25% |
| 4.74% | 63% | 56% | 50% | 45% | 41% | 38% | 35% | 33% | 30% | 29% |
| 5.40% | 72% | 63% | 57% | 51% | 47% | 43% | 40% | 37% | 35% | 33% |
| 6.07% | 81% | 71% | 64% | 58% | 53% | 48% | 45% | 42% | 39% | 37% |
| 6.74% | 89% | 79% | 71% | 64% | 58% | 54% | 50% | 46% | 43% | 41% |
| 7.40% | 98% | 87% | 78% | 70% | 64% | 59% | 55% | 51% | 48% | 45% |

From Table 4.38, we can see those investment rates with red color satisfy the expected market value higher than book value. When ROIC is higher than WACC, we know that with same ROIC, higher investment rate will lead to higher growth rate and higher expected market value. We also present our result by using three-dimensional figure.

Figure 4.19 Absolute changes of expected value for CR beer when g and ROIC changes together (Unit: million yuan)




The red pillars show the combinations with positive absolute change of expected value, we can see from table that when ROIC become greater, and growth rate closer to WACC, the possibility of expected market value greater than book value will become greater.

### 4.6 Liquidation value

Since we already know CR beer is overvalued, we need to analysis the liquidation value and compare it with the expected market value we calculate. When the liquidation value is higher than expected market value, we suggest selling the company at present, when the liquidation value is lower than expected market value, it is better to continue the company. Liquidation value is estimated through assets like fixtures, real estate, equipment, and inventory owned by a company. Intangible assets (like goodwill, business' intellectual property, and brand recognition) are, however, not counted in the liquidation value of a company.

Table 4.39 Liquidation value (Unit: million yuan)

| | 2017 | Discount rate | Liquidation value |
|---|---|---|---|
| **Assets** | | | |
| Total cash | 2361 | 100% | 2361 |
| Receivables | 1006 | 70% | 704 |
| Inventories | 5826 | 60% | 3496 |
| Other current assets | 193 | 50% | 97 |
| **Total current assets** | **9386** | | |
| PP&E | 20449 | 50% | 10225 |
| other non-current assets | 10816 | | |
| **Total non-current assets** | 31265 | | |
| **Total assets** | 40651 | | 16882 |

Table 4.39 shows the items of Balance sheet. We will give different discount rate for different types of assets according to the standards of liquidation[10]. Because the calculation of discount rate in liquidation value is relatively subjective, we can set discount rate according to some examples[11]. As for cash, it is the most liquidity assets in total assets, the liquidation value will be equal to the book value, for the receivables, we assume from conservative side that 70% of receivables can be taken back, for the inventory, beer has short shelf-life, the longer it store, the value will be lower, therefore we assume CR beer can get back 60% liquidation value of total inventory, for the other current assets, we will give a neutral 50% discount rate, for the fixed assets, CR beer's fixed assets are mostly planet and equipment, we can give it 50% discount rate. we will exclude other non-current assets such as goodwill and intangible assets. Finally, we can calculate the value of total assets after liquidation are 16882 million yuan. After compared with expected market, we find that expected market value we estimate is higher than the liquidation value. Therefore, we suggest not to sell company, but keep operating.

[10] https://www.fasb.org/jsp/FASB/Document_C/DocumentPage&cid=1176163467098

[11] https://www.wallstreetmojo.com/liquidation-value/#calculation

## 5. Conclusion

CR beer is one of the biggest beer company in China. Total sales of its beer have been ranked first in the Chinese market for many years since 2006. It is famous for its product “snow”. In 2015, company completed business restructuring and transformed itself into a beer-focused enterprise.

Firstly, we make financial analysis for CR beer, we find that the profitability ratio in 2014 is very low, the reason is that the retail business of company had a great loss in 2014, and the cost of sales, general and administrative expenses also increased a lot in 2014, but after the transformation in 2015, CR beer’s profitability increased a lot, the liquidity ratio of CR beer had became better but still not so good since transformation, this is because company must pay for high employee compensation for closing it factories, the solvency of company improved, the activity ratio behaved good since transformation. Therefore, we can state that transformation in 2015 is a good decision.

Then we use two-stage DCF method to predict the expected market value, the result is 18492 million yuan, for the explanation of percentile, we can state that almost 100% possibility that CR beer’s market value will be greater than 13291 million yuan. Compared with CR beer’s book value in 2017 is 40651 million yuan, it is much lower than book value, it means CR beer is overvalued.

Then we do sensitivity analysis of ROIC and g, we find that only when ROIC is higher than WACC and growth rate increase, company’s market value has probability to be higher than book value, which means company need to make it investment more efficient.

Finally, we calculate liquidation value, which is equal to 16882 million yuan, it is lower than the expected market value we predict, therefore it is better to keep operating business. We should also focus on the real situation of company, because there was a huge expenses and cost for development since the transformation in 2015, company need time to recover its business. On the other hand, in recent years, company not only sell cheap beer, but also start to focus on high-quality beer, it invested a lot of money in high-

quality beers, but the effect is not obvious in the short run. Therefore, the investment rate and ROIC is relatively low in recent years, this will also influence our estimation of valuation and make our expected market value lower than book value.

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## List of Abbreviations

| | |
|---|---|
| CR beer | China Resource Beer Company Limited |
| DCF | Discounted Cash Flow |
| ROA | Return on assets |
| ROE | Return on equity |
| CAPM | Capital assets pricing model |
| FCFF | Free cash flow for company |
| WACC | Weighted average cost of capital |
| TV | Terminal value |
| ROIC | Return on invested capital |
| IR | Investment rate |
| EBIT | Earnings before interest and tax |
| NWC | Net working capital |
| EAT | Earning after tax |
| YTM | Yield to maturity |
| OLS | Ordinary least square |
| GDP | Gross domestic product |
| CPI | Consumer price index |
| INV | Investment |
| DEP | Depreciation |
| SWOT | Strengths weakness opportunities and treats |
| res | Number of restaurants |
| urb | Urban population |
| CA | Current assets |
| CL | Current liabilities |
| NOPAT | Net operating profit after taxes |

**Declaration of Utilisation of Results from the Diploma Thesis**

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Ostrava dated 22.04.2019

Meng Xu

Student's name and surname

## List of Annexes

## Annex 1

Income statement of CR beer from 2008 to 2017

| Million yuan | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| **Sales** | 50459 | 56453 | 73811 | 89274 | 102381 | 115105 | 133174 | 27959 | 28694 | 29732 |
| Cost of sales | -38132 | -41629 | -54812 | -67105 | -77725 | -85723 | -99700 | -19272 | -19021 | -19703 |
| Gross margin | 12326 | 14824 | 18999 | 22169 | 24656 | 29381 | 33474 | 8687 | 9673 | 10029 |
| Selling expenses | -8216 | -9695 | -13091 | -15668 | -17754 | -21671 | -27527 | -4552 | -5033 | -5012 |
| General and administrative expenses | -2486 | -3085 | -3861 | -4206 | -4869 | -5606 | -6766 | -3003 | -3535 | -3976 |
| Other business income | 1276 | 1569 | 2200 | 2031 | 3303 | 1661 | 2173 | 651 | 652 | 810 |
| share of net results of associates | 325 | 285 | 23 | 8 | 39 | 21 | | | | |
| **EBIT** | 3226 | 3897 | 4270 | 4335 | 5376 | 3786 | 1354 | 1783 | 1757 | 1851 |
| interest income | 71 | 176 | 145 | 244 | 313 | 420 | 563 | 168 | 71 | 93 |
| financial cost | -433 | -172 | -149 | -182 | -293 | -239 | -415 | -228 | -89 | -128 |
| **Income from operations (EBT)** | 2863 | 3901 | 4266 | 4397 | 5396 | 3967 | 1452 | 1723 | 1739 | 1816 |
| taxation | -673 | -806 | -1187 | -1261 | -1323 | -1489 | -1222 | -394 | -320 | -630 |
| **Income after taxes (EAT)** | 2190 | 3095 | 3078 | 3136 | 4073 | 2478 | 229 | 1329 | 1419 | 1186 |

## Annex 2 (1/2)

Balance sheet of CR beer from 2008 to 2017

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Assets | | | | | | | | | | |
| Total cash | 6681 | 7507 | 11975 | 14794 | 12981 | 16667 | 16283 | 2802 | 3487 | 2361 |
| Receivables | 4801 | 4588 | 5824 | 9347 | 11147 | 12915 | 13056 | 1531 | 1253 | 1006 |
| Inventories | 10149 | 9800 | 13299 | 16786 | 17228 | 19671 | 21838 | 6488 | 6110 | 5826 |
| Other current assets | 147 | 1370 | 238 | 251 | 418 | 461 | 271 | 215 | 178 | 193 |
| Total current assets | 21778 | 23265 | 31336 | 41178 | 41774 | 49714 | 51448 | 11036 | 11028 | 9386 |
| PP&E | 32057 | 33590 | 35271 | 40747 | 46205 | 54337 | 69448 | 21383 | 20900 | 20449 |
| other non-current assets | 7767 | 9577 | 9480 | 10173 | 15418 | 18031 | 22136 | 10350 | 10702 | 10816 |
| Total non-current assets | 39825 | 43167 | 44751 | 50920 | 61623 | 72369 | 91584 | 31733 | 31602 | 31265 |
| **Total assets** | 61602 | 66432 | 76087 | 92098 | 103397 | 122083 | 143032 | 42769 | 42630 | 40651 |

## Annex 2 (2/2)

Balance sheet of CR beer from 2008 to 2017

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| taxation payable | 382 | 290 | 723 | 494 | 573 | 908 | 843 | 194 | 80 | 207 |
| trade and other payables | 17021 | 22114 | 27639 | 36861 | 43069 | 54385 | 60142 | 16779 | 16411 | 16605 |
| Other current liabilities | 0 | 479 | 19 | 6 | 0 | 0 | 0 | 0 | 2722 | 0 |
| Total current liabilities | 22240 | 25808 | 31913 | 43109 | 47189 | 57932 | 68103 | 18750 | 20805 | 19195 |
| Total non-current liabilities | 8941 | 9423 | 9034 | 9295 | 12587 | 17286 | 20021 | 4699 | 4158 | 2971 |
| **Total liabilities** | 31181 | 35232 | 40947 | 52404 | 59776 | 75219 | 88124 | 23449 | 24963 | 22166 |
| **Total equity** | 30422 | 31201 | 35140 | 39694 | 43620 | 46864 | 54908 | 19320 | 17667 | 18485 |
| Total capital | 61602 | 66432 | 76087 | 92098 | 103397 | 122083 | 143032 | 42769 | 42630 | 40651 |